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HS-803-837

PERFORMANCE CHARACTERISTICS OF AUTOMOTIVE ENGINES IN THE UNITED STATES

Third Series Report No. 8

1978 Buick, 231 CID (3.8 Liter), 4V, Turbocharged

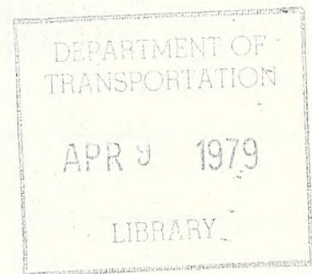
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U.S. DEPARTMENT OF ENERGY
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FEBRUARY 1979

INTERIM REPORT



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Prepared for
U.S. DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION
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16. Abstract Experimental data were obtained in dynamometer tests of a 1978 Buick 231 CID turbocharged to determine fuel consumption and emissions (hydrocarbon, carbon monoxide, oxides of nitrogen) at steady-state engine operating modes. The objective of the program is to obtain engine performance data for estimating emissions and fuel economy for varied engine service and duty. The intent of the work is to provide basic engine characteristic data required as input for engineering calculations involving ground transportation.					
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PREFACE

This report, prepared by the U.S. Department of Energy, Bartlesville Energy Technology Center for the U.S. Department of Transportation, Transportation Systems Center, Energy Technology Branch, Cambridge, MA, presents results of experimental work to obtain information on performance characteristics of an engine used in automobiles sold in the United States. The Buick, 231-CID turbocharged engine used in this work is one of a series of 15 engines to be tested in the current program. This is the eighth of the reports to be published covering work with those engines.

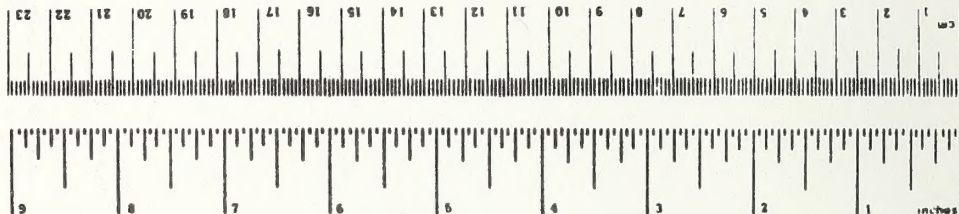
This project is funded by the National Highway Traffic Safety Administration, Office of Research and Development, Office of Passenger Vehicle Research, Technology Assessment Division.

James A. Kidd, Jr. and Ralph G. Colello of the U.S. Department of Transportation, Transportation Systems Center, are the technical monitors.

METRIC CONVERSION FACTORS

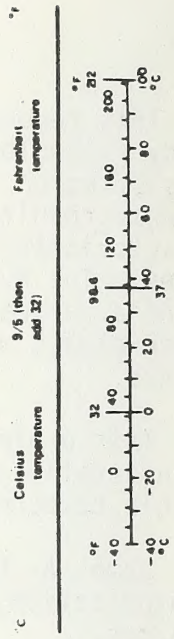
Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
in	inches	2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
AREA				
in ²	square inches	6.5	square centimeters	cm ²
ft ²	square feet	0.09	square meters	m ²
yd ²	square yards	0.8	square meters	m ²
mi ²	square miles	2.6	square kilometers	km ²
	acres	0.4	hectares	ha
MASS (weight)				
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
VOLUME				
tap	teaspoons	5	milliliters	ml
Tabsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft ³	cubic feet	0.03	cubic meters	m ³
yd ³	cubic yards	0.76	cubic meters	m ³
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C



Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
LENGTH				
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
AREA				
cm ²	square centimeters	0.16	square inches	in ²
m ²	square meters	1.2	square yards	yd ²
km ²	square kilometers	0.4	square miles	mi ²
ha	hectares (10,000 m ²)	2.5	acres	ac
MASS (weight)				
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	st
VOLUME				
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m ³	cubic meters	35	cubic feet	ft ³
m ³	cubic meters	1.3	cubic yards	yd ³
TEMPERATURE (exact)				
°C	Celsius temperature	9/5 (then add 32)	Fahrenheit temperature	°F



1. INTRODUCTION

The objective of this program is to obtain engine performance data for estimating fuel economy and emissions for varied engine service and duty. The intent of the work done at Bartlesville Energy Technology Center is to provide basic engine characteristic data required as input for engineering calculations of fuel consumption and emissions involving ground transportation.

The data acquired from tests of a 1978 Buick 231 CID turbocharged engine are presented in this report. Buick uses the 231 CID turbocharged engine in the Regal Sport Coupe and in the LeSabre Sport Coupe. These automobiles are in the 3,500 lb to 4,000 lb weight class. The engine, as equipped, is intended for use in a forty-nine state (Federal) vehicle with automatic transmission. The test results are sufficient to establish steady-state maps for fuel consumption and emissions (carbon monoxide, unburned hydrocarbons, and oxides of nitrogen) over the entire operating range of the engine.

2. ENGINE TEST REPORT

The engine test setup included a complete mean-tolerance engine (SAE definition) coupled to an eddy-current dynamometer. A cooling tower was used in place of the fan and radiator. The alternator was included but was not wired into the engine's electrical system. The emission control systems included exhaust-gas-recirculation, positive crankcase ventilation, air-injection, early fuel evaporation, and an oxidation catalyst. The manufacturer's engine specifications are listed in Table 1.

Prior to testing, engine break-in consisted of 40 hours of operation at various speed/load modes representative of normal engine operation. Table 2 contains details of the break-in schedule. A single batch of unleaded regular grade gasoline was used throughout the break-in and test; a detailed fuel analysis is given in Table 3. Engine testing began on June 23, 1978, and ended on July 14, 1978.

During steady-state tests, the engine was operated at the following speed/load modes:

Speeds: 1,000; 1,300; 1,700; 2,000; 2,400; 2,800; 3,400;
4,000 rpm

Loads: 0, 10, 25, 40, 60, 75, 90, 100 pct of full load
(0, 10, 25, 60, and 75 pct points were repeated at
all engine speeds)

Idle speed/load modes: 800 rpm -- 0, 10, 15 lb-ft
700 rpm -- 26 lb-ft

Total number of test modes.....	68
Total number of repeats.....	44
Total number of tests.....	112

The following data were recorded for each test point:

Test number
Data source code (1 = before catalyst, 2 = after catalyst)
Date
Barometric pressure, mm Hg
Wet bulb temperature, °F
Dry bulb temperature, °F
Inlet air temperature, °F
Speed, rpm
Torque, lb-ft -- Daytronic strain gauge load cell
Fuel rate, lb/hr -- Fluidyne positive displacement fuel flow meter
Ignition timing, °BTC

Manifold vacuum, in. Hg
 Intake manifold pressure, in. Hg before and after turbocharger
 Throttle angle, degrees
 CO, pct -- Beckman NDIR
 CO₂, pct -- Beckman NDIR
 O₂, pct -- Beckman polarographic detector
 HC, ppmC -- Custom-built heated flame ionization detector
 NO_x, ppm -- Thermo-Electron chemiluminescent detector
 Oil temperature, °F
 Oil pressure, psig
 Coolant temperature, °F
 Exhaust temperature, °F
 Exhaust pressure, in. H₂O
 Intake manifold temperature, °F

The following equations were used in calculating power, air-fuel ratio, absolute humidity, and mass emission rates of carbon monoxide (CO), unburned hydrocarbons (HC), and oxides of nitrogen (NO_x):

1. Partial pressure of water vapor in intake air (millimeters of mercury):

$$P = \exp \left[18.717 - \frac{7308.1}{393 + D} \right]$$

where D = Dew point, °F

2. Absolute humidity (grains moisture per pound dry air):

$$H = \frac{4347.8(P)}{B - P}$$

where B = Barometric pressure, mm Hg

3. Humidity correction factor (dimensionless):

$$K_H = \frac{1}{1 - 0.0047(H - 75)}$$

Note: This factor is used to correct the NO_x mass emission rate to a standard humidity of 75 grains moisture per pound dry air.

4. Hydrogen concentration in raw exhaust (percent):

$$H_2 = \frac{x(CO)(CO + CO_2)}{2(CO + 3CO_2)}$$

where CO = Carbon monoxide concentration (percent)
CO₂ = Carbon dioxide concentration (percent)

Note: This equation assumes a water-gas shift equilibrium constant:

$$\frac{(CO)(H_2O)}{(CO_2)(H_2)} = 3$$

5. Correction factor for emission concentrations from wet basis to dry basis (dimensionless):

$$C_w = 1 + \frac{(x/2)(CO + CO_2) - H_2}{100}$$

Note: In these tests only HC is measured on a wet basis.
All other species are measured on a dry basis.

6. Air-fuel ratio (dimensionless):

$$AF = \frac{68.9994}{MW_{fuel}} \left[\frac{(1 + \frac{x}{2} - y)(CO) + (2 + \frac{x}{2} - y)(CO_2) + 2(O_2) + \frac{NO_x}{10^4} - H_2}{CO + CO_2 + C_w HC/10^4} \right]$$

where O₂ = Oxygen concentration (percent)
NO_x = Oxides of nitrogen (ppm)
HC = Unburned hydrocarbon concentration (ppmC)
x = Fuel hydrogen/carbon atomic ratio
y = Fuel oxygen/carbon atomic ratio
MW_{fuel} = Fuel molecular weight per carbon atom
= 12.01115 + 1.0079x + 15.9994y

7. Carbon monoxide mass emission rate (grams per hour):

$$M_{CO} = \left(\frac{MW_{CO}}{MW_{fuel}} \right) \left[\frac{CO (M_f)}{CO + CO_2 + C_w (\%HC)} \right] (453.59237)$$

MW_{CO} = Molecular weight of CO (28.01055)
M_f = Fuel rate in lb/hour
%HC = HC (ppmC)/10⁴

8. Unburned hydrocarbon mass emission rate (grams per hour):

$$M_{HC} = \left(\frac{MW_{HC}}{MW_{fuel}} \right) \left[\frac{(\%HC) (M_f) (C_w)}{CO + CO_2 + C_w(\%HC)} \right] \quad (453.59237)$$

MW_{HC} = Molecular weight of hydrocarbon per carbon atom
 $= 12.01115 + 1.00797x + 15.9994y$

9. Oxides of nitrogen mass emission rate (grams per hour):

$$M_{NO_x} = \left(\frac{MW_{NO_x}}{MW_{fuel}} \right) \left[\frac{\%NO_x + M_f}{CO + CO_2 + C_w(\%HC)} \right] \quad (453.59237) (K_H)$$

MW_{NO_x} = Molecular weight of $NO_2 = 46.0055$

$\%NO_x = NO_x(ppm)10^4$

10. Power (brake horsepower corrected to a standard barometric pressure of 736.6 mm Hg and a standard temperature of 85° F):

$$HP = \left[\frac{N (T)}{5252.113} \right] \left(\frac{736.6}{B - P} \right) \sqrt{\frac{t + 460}{545}}$$

where N = Engine speed (revolutions per minute)

T = Brake torque (lb-ft)

t = Air temperature (°F)

3. DISCUSSION OF TEST RESULTS

Brake horsepower, torque, and brake specific fuel consumption (bsfc) are plotted as a function of engine speed at the maximum throttle opening limited by detonation (Figure 1). The maximum brake horsepower and the maximum torque produced at this knock-limited condition are lower than the manufacturer's values quoted in Table 1 by 42 percent and 32 percent, respectively. Operation at wide-open-throttle was not possible due to the severe detonation encountered at these operating modes. The engine is equipped with detonation control equipment which incorporates a detonation sensor in the intake manifold. The detonation sensor detects the presence and intensity of all vibrations and feeds this information to the detonation control equipment. The Turbo Control Center (controller) processes the sensor signal and then provides the appropriate command signal to the distributor to determine actual spark timing. The amount of spark timing retard is a result of the severity of the detonation. As the detonation subsides, timing is restored at a predetermined rate in the direction of normal spark timing.

The maximum power modes were operated at the threshold of detonation. The engine speed was set at the specified rpm and the load was increased until detonation was encountered and the rpm sharply decreased due to the retarded timing. As the engine stabilized at this speed/load condition the maximum power was established at each speed.

Upon completion of the above testing, a high octane fuel (97.4 Research Octane) was used to determine the engine power characteristics with a high octane fuel. Slight detonation was still audible with the high octane fuel. The maximum brake horsepower and the maximum torque produced with the high octane fuel (detonation limited) are also lower than the manufacturer's values by 9 percent and 14 percent, respectively, but were produced at engine speeds similar to the manufacturer's specifications.

Fuel rates were found to be nearly a linear function of power for most engine speeds (Figure 2) and were repeatable for all speeds duplicated. The air-fuel ratios are plotted as a function of power for all engine speeds (Figure 3) and were repeatable for all speeds duplicated. Due to the additional air injected into the exhaust gas by the air-injection pump, the air-fuel calculations do not represent the actual stoichiometry in the combustion chamber.

Emissions of CO, HC, and NO_x are plotted as a function of power for all engine speeds (Figures 4 thru 6). The oxidation catalyst effectively reduced the emissions of CO and HC at all engine speeds except those at which the air-fuel ratio was relatively low. The low air-fuel ratios and the high emission levels of CO and HC at these modes indicate a lack of available oxygen to support the oxidation process, thus reducing the effectiveness of the catalyst. The emissions of CO, HC, and NO_x were repeatable for most speeds duplicated.

4. CONCLUSIONS

The experimental work to obtain performance data for the Buick 231 CID turbocharged engine has been completed; these data are presented in the tables accompanying this report.

TABLE 1. MANUFACTURER'S ENGINE SPECIFICATIONS

Displacement, cubic inches.....	231
Maximum horsepower, bhp @ 4,000 rpm.....	165
Maximum torque, lb-ft @ 2,800 rpm.....	265
Bore and stroke, inches.....	3.80 x 3.400
Configuration.....	V-6
Compression ratio.....	8:1
Firing order.....	1-6-5-4-3-2
Ignition timing at idle speed, ° @ 600 rpm (vacuum off).....	15
Block material.....	cast alloy iron
Head material.....	cast alloy iron
Number of crankshaft main bearings.....	4
Number of compression rings/piston.....	2
Number of oil rings/piston.....	1
Cam drive type.....	timing chain
Valve lift:	
Intake, inches.....	0.323
Exhaust, inches.....	0.366
Valve timing:	
Intake opens, °BTC.....	18
Intake closes, °ABC.....	48
Exhaust opens, °BBC.....	68
Exhaust closes, °ATC.....	29
Spark plug gap, inches.....	0.060
Engine weight, lbs.....	550
Exhaust-gas-recirculation system:	
Valve type.....	back pressure
Control signal.....	vacuum
Point of discharge.....	carburetor plenum
Crankcase emission control:	
Control method.....	positive crankcase ventilation
Point of discharge.....	intake manifold
Carburetor type.....	4-venturi downdraft
Distributor specifications:*	
Centrifugal advance, begins, ° @ 1,065 rpm.....	0
Centrifugal advance, intermediate, ° @ 1,600 rpm.....	7
Centrifugal advance, full, ° @ 4,000 rpm.....	21
Vacuum advance, begins, ° @ 4 in. Hg.....	6.7
Vacuum advance, maximum, ° @ 12.5 in. Hg.....	20
Carburetor number.....	17058240
EGR valve number.....	K717057162, 33672
Distributor number.....	1110735

*Engine rpm, crankshaft degrees.

TABLE 2. ENGINE BREAK-IN SCHEDULE

Simulated vehicle, speed, mph	Engine speed, rpm	Intake manifold vacuum, in. Hg	Fraction of time in mode
Idle	800	18.5	1/10
20	1,000	14.5	"
30	1,400	13.5	"
40	1,600	12.5	"
50	1,800	11.5	"
60	2,000	10	"
25	1,200	14	"
35	1,500	13	"
45	1,700	12	"
55	1,900	11	"

Simulated mileage per cycle = 90 miles.

Total mileage simulated over 40 hours break-in period = 1,440 miles.

TABLE 3. FUEL ANALYSIS

Fuel No.....	7718
Research octane No.....	91.8
Motor octane No.....	84.0
Specific gravity.....	0.717
API gravity, degrees.....	65.9
Distillation, °F:	
10 pct evaporated.....	123
50 pct ".....	209
95 pct ".....	402
100 pct ".....	413
Reid vapor pressure, psi.....	11.26
FIA analysis, pct:	
Aromatics.....	9
Olefins.....	15
Paraffins.....	76
Sulfur, pct.....	0.016
Lead, grams per gallon.....	Trace
Hydrogen/carbon atomic ratio.....	2.038

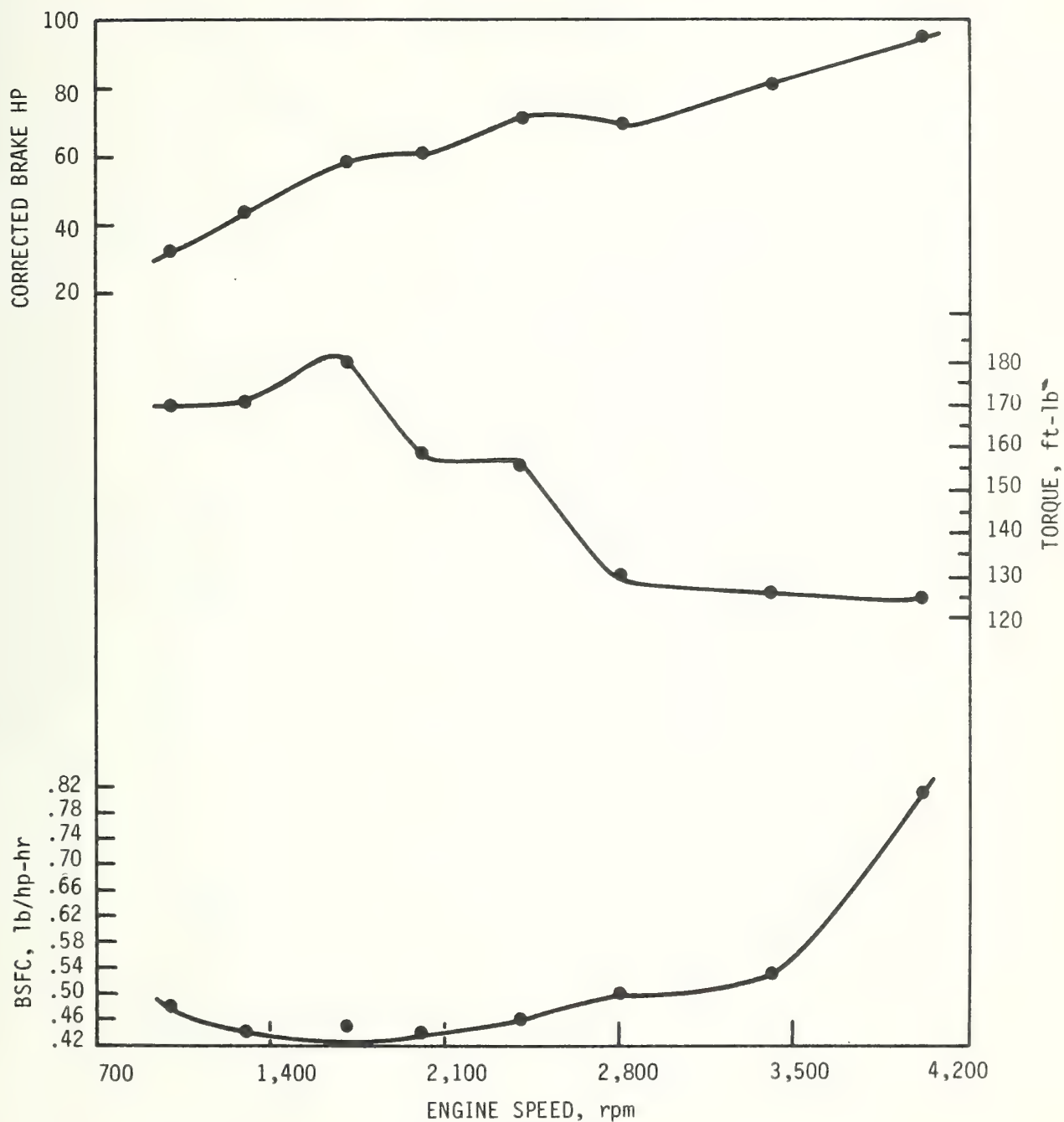


FIGURE 1. Brake Specific Fuel Consumption, Torque, and Brake Horsepower Versus Engine rpm at Wide-Open-Throttle--Buick 231 CID Turbocharged Engine.

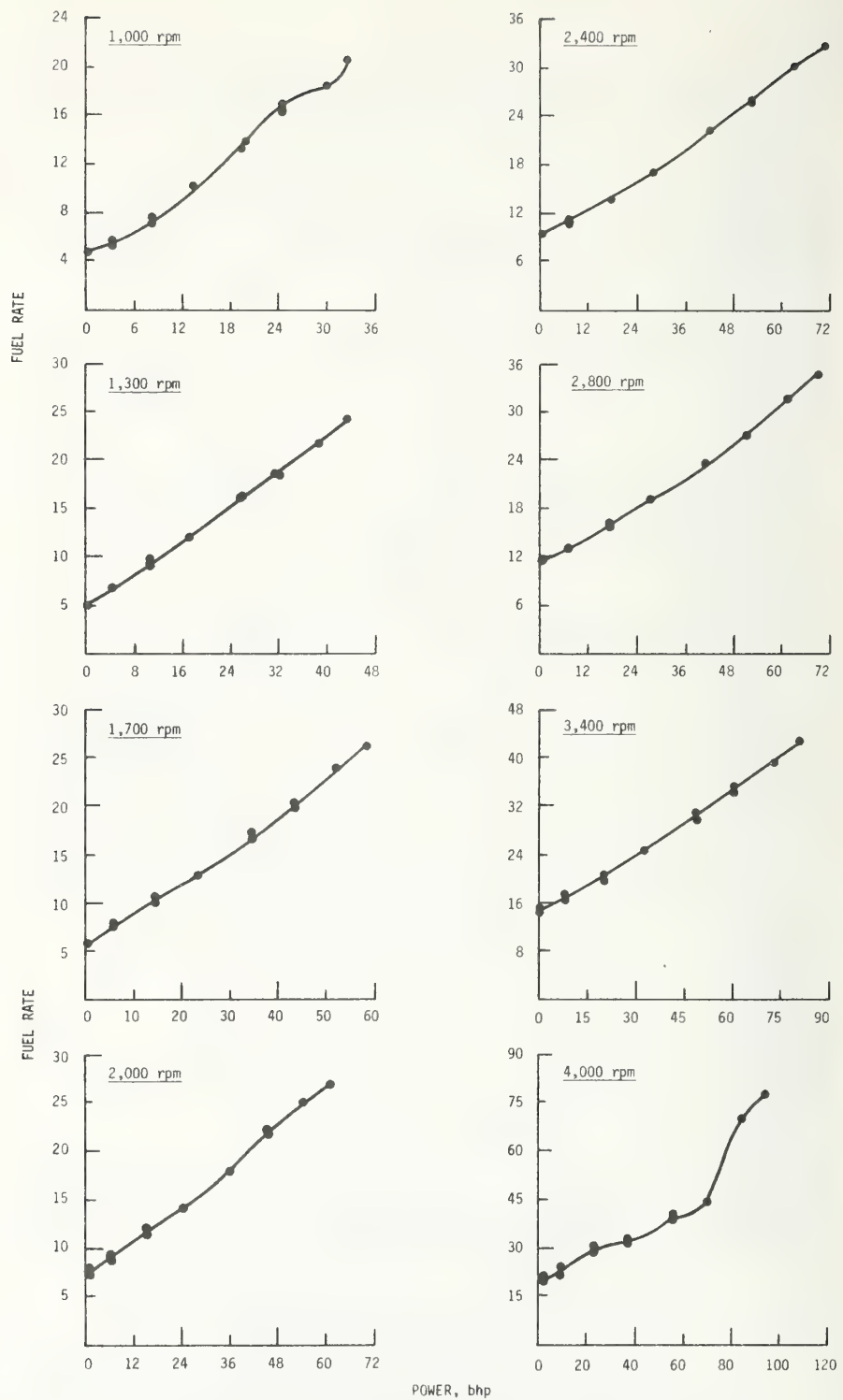


FIGURE 2. Fuel Rate Versus Power at Various Speed and Load Conditions--Buick 231 CID Turbocharged Engine.

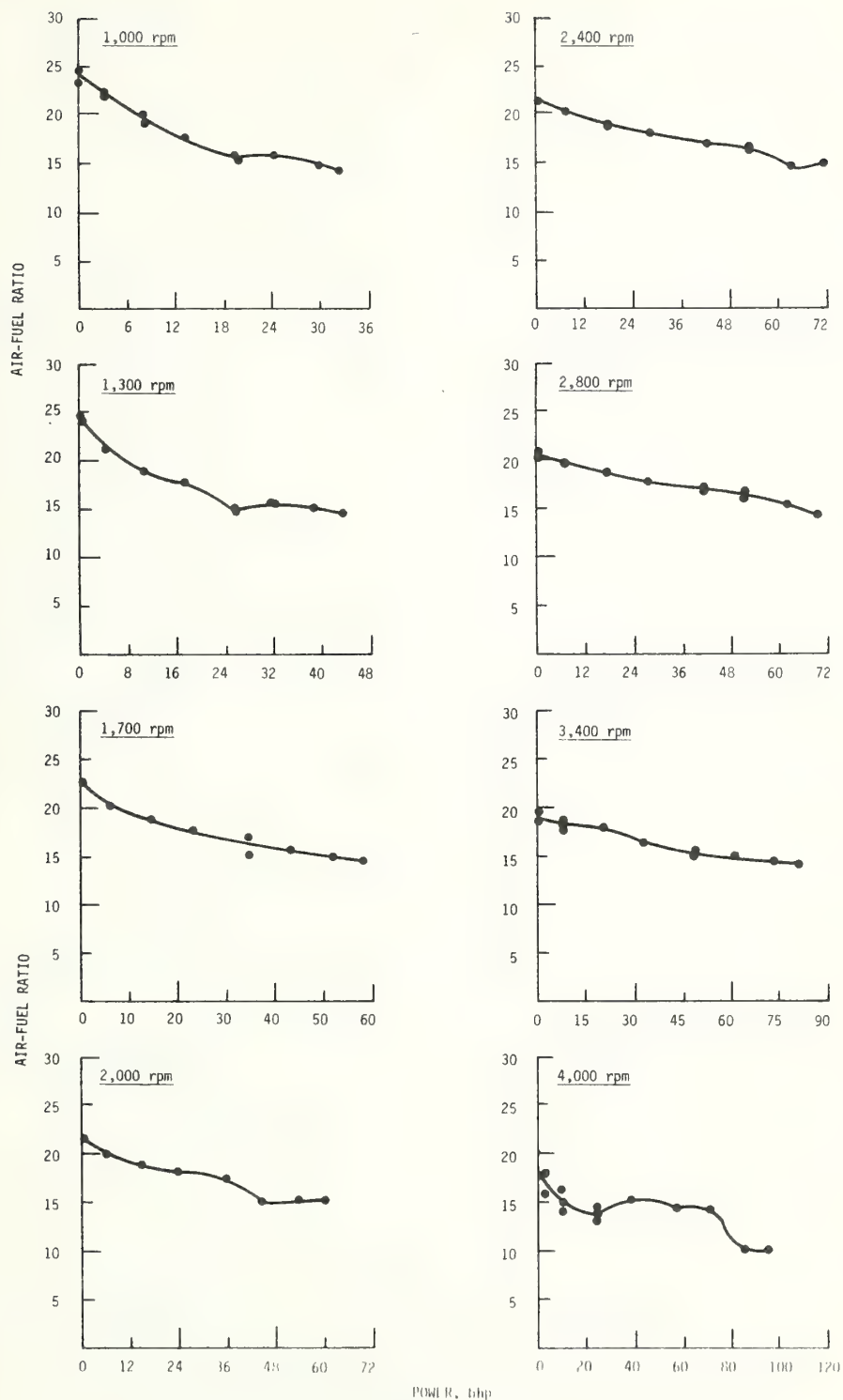


FIGURE 3. Air-Fuel Ratio Versus Power at Various Speed and Load Conditions--Buick 231 CID Turbocharged Engine.

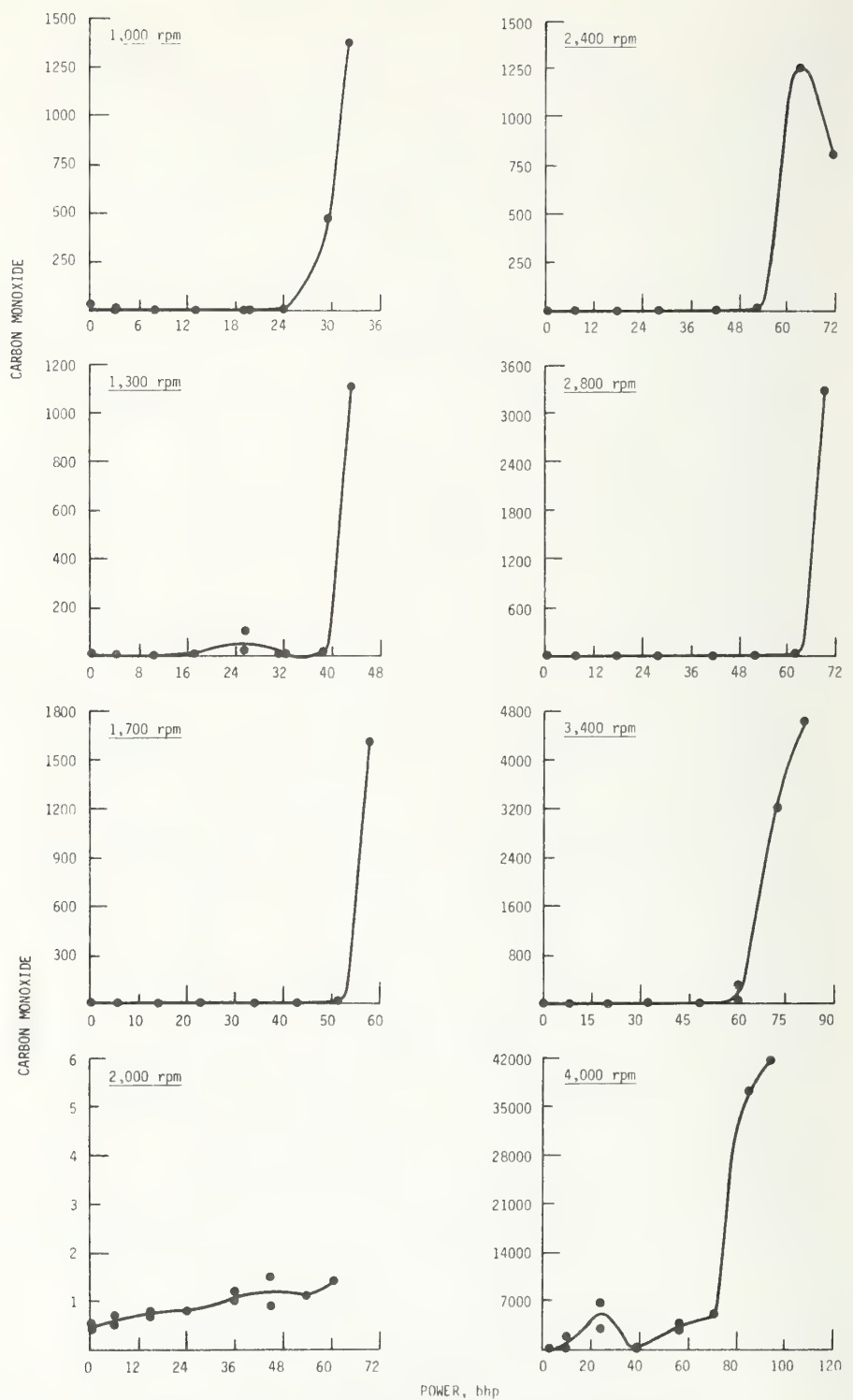


FIGURE 4. Carbon Monoxide Emissions Versus Power at Various Speed and Load Conditions--Buick 231 CID Turbo-charged Engine.

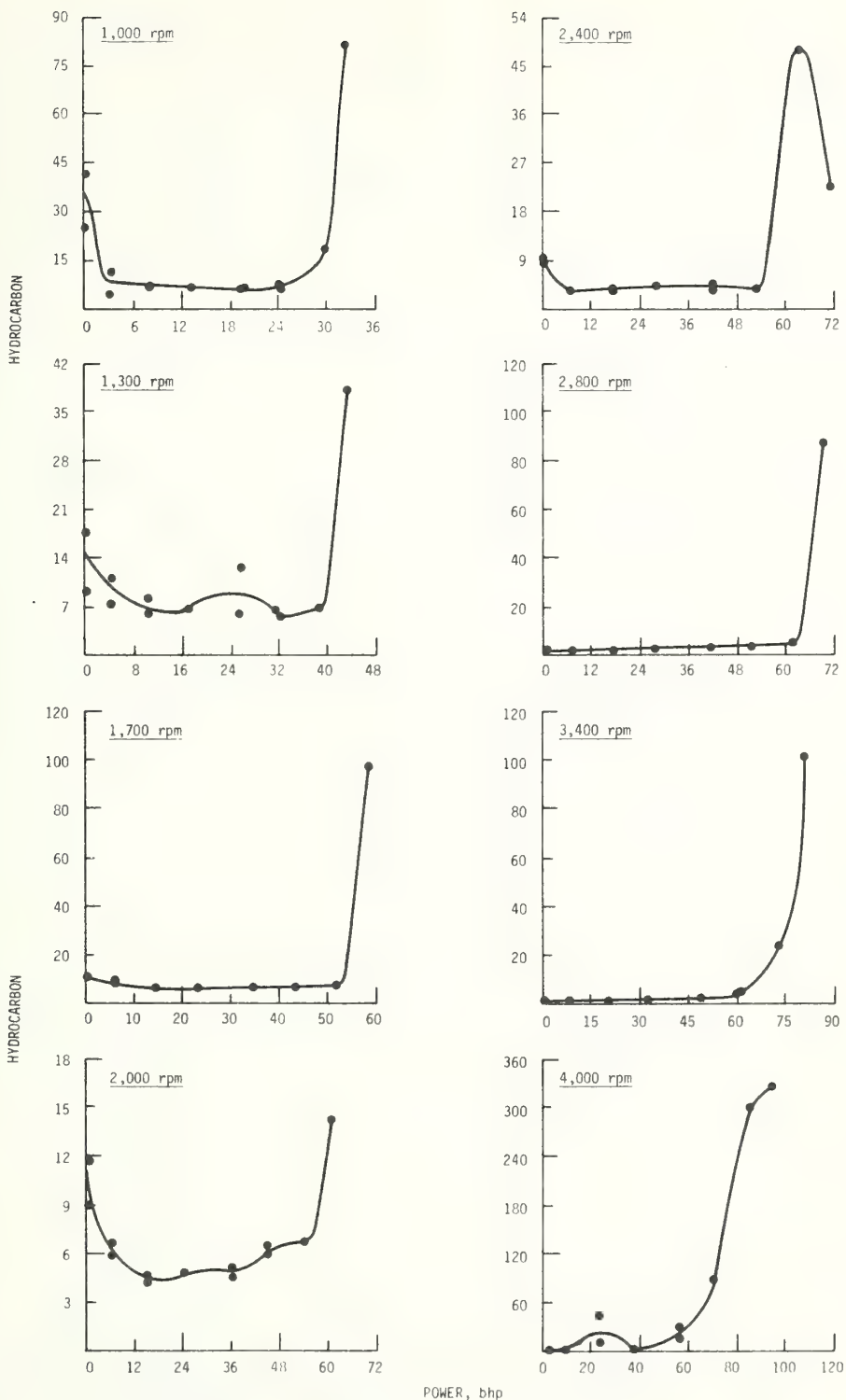


FIGURE 5. Hydrocarbon Emissions Versus Power at Various Speed and Load Conditions--Buick 231 CID Turbocharged Engine.

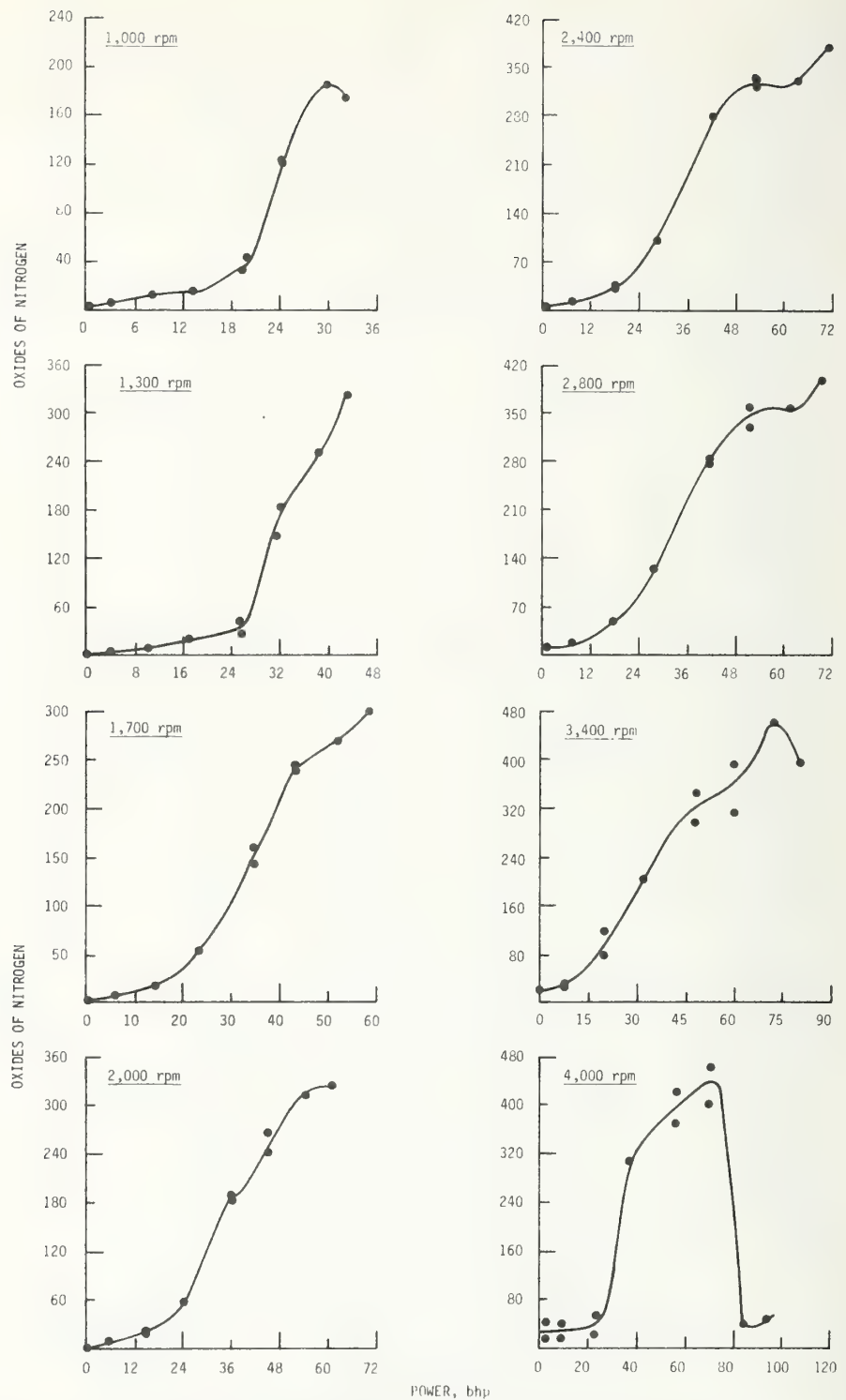


FIGURE 6. Oxides of Nitrogen Emissions Versus Power at Various Speed and Load Conditions--Buick 231 CID Turbo-charged Engine.

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

INTAKE MAN. PRESSURE, IN HG

BEFORE TURBOCHARGER

AFTER TURBOCHARGER

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

1.01	1.02	2.01	2.02	3.01	3.02
1	2	1	2	1	2
6/23/78	6/23/78	6/23/78	6/23/78	6/23/78	6/23/78
742.5	742.5	742.5	742.5	742.5	742.5
86	86	86	86	86	86
74	74	75	75	74	74
800	800	800	800	800	800
6	6	10.0	10.0	15.0	15.0
1	1	1.5	1.5	2.3	2.3
3.0	2.9	3.2	3.2	3.5	3.5
25.0	25.0	25.0	25.0	26.0	26.0
-19.8	-19.8	-19.0	-19.0	-18.5	-18.5
-21.0	-21.0	-20.0	-20.0	-20.0	-20.0
0	0	5	5	1.0	1.0
82	82	83	83	84	84
1277	1288	0958	1117	0825	1023
8.79	8.74	9.36	9.30	9.51	9.63
8.48	8.60	7.70	7.64	7.47	7.27
2407	2445	1718	1675	1519	1535
2	2	12	15	42	42
23.41	23.57	22.33	22.30	22.05	21.74
37.5	37.3	28.7	33.6	27.0	33.0
35.5	35.5	25.9	25.3	25.0	24.9
1	1	6	8	2.4	2.4
185	185	186	186	188	188
20	20	20	20	20	20
180	180	180	180	180	180
0	0	0	0	0	0
348	269	332	265	352	261

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	4.01	4.02	5.01	5.02	6.01	6.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/23/78	6/23/78	6/23/78	6/23/78	6/26/78	6/26/78
BAROMETER, MMHG	742.5	742.5	742.5	742.5	738.8	738.8
HUMIDITY, GRAINS/LB	86	86	86	86	142	142
TEMPERATURE, F	75	75	71	71	77	77
ENGINE SPEED, RPM	700	700	1000	1000	1000	1000
TORQUE, FT-LB	26.0	26.0	170.0	170.0	153.0	153.0
POWER, BHP*	3.5	3.5	32.4	32.4	29.9	29.9
FUEL RATE, LB/HR	3.5	3.5	15.4	15.5	13.9	13.9
IGNITION TIMING, DEG BTDC	25.0	25.0	15.0	15.0	15.0	15.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-17.2	-17.2	-1.0	-1.0	-2.3	-2.3
AFTER TURBOCHARGER	-18.0	-18.0	-4.0	-4.0	-2.2	-2.2
THROTTLE ANGLE, DEG	0	0	23.0	23.0	20.0	20.0
INTAKE MAN. TEMP., F	84	84	131	131	87	87
CONCENTRATIONS, DRY BASIS						
CO, %	1382	1458	1.7347	1.5475	.9399	.5670
CO2, %	9.95	9.95	13.51	13.87	13.85	14.45
O2, %	6.76	6.72	.65	.23	.63	.13
HC, PPMC	1994	1939	2239	1814	1713	442
NOX, PPM	123	116	1080	1119	1148	930
AIR/FUEL RATIO	20.88	20.85	14.29	14.16	14.68	14.63
EMISSION RATES, G/HR						
CO	42.8	44.4	1559.6	1385.1	790.5	471.8
HC	31.0	29.7	101.1	81.5	72.4	18.5
NOX+	6.6	6.1	168.2	173.6	232.2	186.1
OIL TEMPERATURE, F	188	188	214	214	218	218
OIL PRESSURE, PSI	16	16	20	20	20	20
COOLANT TEMPERATURE, F	180	180	182	182	181	181
EXHAUST PRESSURE, IN. H2O	0	0	3.0	0	3.0	1.0
EXHAUST TEMPERATURE, F	332	274	761	747	745	757

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	7.01	7.02	8.01	8.02	9.01	9.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE	7/14/78	7/14/78	6/26/78	6/26/78	6/26/78	6/26/78
TEST DATE	744.0	744.0	738.8	738.8	738.8	738.8
BAROMETER, MMHG	87	87	142	142	142	142
HUMIDITY, GRAINS/LB	73	73	79	79	81	81
TEMPERATURE, F	1000	1000	1000	1000	1000	1000
ENGINE SPEED, RPM	127.5	127.5	102.0	102.0	68.0	68.0
TORQUE, FT-LB	24.4	24.4	19.9	19.9	13.3	13.3
POWER, BHP*	12.9	13.0	10.4	10.4	7.6	7.6
FUEL RATE, LB/HR	18.0	18.0	17.0	17.0	29.0	29.0
IGNITION TIMING, DEG BTDC						
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-3.0	-3.0	-4.0	-4.0	-9.0	-9.0
AFTER TURBOCHARGER	-3.5	-3.5	-4.5	-4.5	-10.0	-10.0
THROTTLE ANGLE, DEG	18.0	18.0	13.0	13.0	6.5	6.5
INTAKE MAN. TEMP., F	117	117	149	149	145	145
CONCENTRATIONS, DRY BASIS						
CO, %	.1217	.0017	.0594	.0022	.2479	.0020
CO2, %	13.48	13.72	14.11	14.42	12.03	12.43
O2, %	1.61	1.53	1.17	.91	4.03	3.66
HC, PPM	1471	147	1522	194	1944	226
NOX, PPM	845	808	272	268	93	105
AIR/FUEL RATIO	15.77	15.92	15.44	15.42	17.62	17.67
EMISSION RATES, G/HR						
CO	103.3	1.5	38.8	1.4	136.2	1.1
HC	62.7	6.3	50.0	6.3	53.6	6.3
NOX+	125.4	120.6	42.8	41.8	12.2	14.0
OIL TEMPERATURE, F	215	215	213	213	207	207
OIL PRESSURE, PSI	20	20	20	20	20	20
COOLANT TEMPERATURE, F	184	184	178	178	179	179
EXHAUST PRESSURE, IN. H2O	4.0	1.0	2.0	.0	1.0	.0
EXHAUST TEMPERATURE, F	772	726	703	669	616	625

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	10.01	10.02	11.01	11.02	12.01	12.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/26/78	6/26/78	6/26/78	6/26/78	6/26/78	6/26/78
BAROMETER, MMHG	738.8	738.8	738.8	738.8	738.8	738.8
HUMIDITY, GRAINS/LB	142	142	142	142	142	142
TEMPERATURE, F	82	82	83	83	84	84
ENGINE SPEED, RPM	1000	1000	1000	1000	1000	1000
TORQUE, FT-LB	42.5	42.5	17.0	17.0	1.6	1.6
POWER, BHP*	8.3	8.3	3.3	3.3	.3	.3
FUEL RATE, LB/HR	5.7	5.7	4.1	4.2	3.4	3.5
IGNITION TIMING, DEG BTDC	34.0	34.0	29.0	29.0	27.0	27.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-14.2	-14.2	-19.0	-19.0	-20.0	-20.0
AFTER TURBOCHARGER	-15.3	-15.3	-20.0	-20.0	-21.0	-21.0
THROTTLE ANGLE, DEG	3.5	3.5	1.5	1.5	1.0	1.0
INTAKE MAN. TEMP., F	122	122	86	86	84	84
CONCENTRATIONS, DRY BASIS						
CO, %	3898	.0075	.2126	.0430	.1456	.0942
CO2, %	10.95	11.40	9.48	9.67	8.67	8.82
O2, %	5.25	5.00	7.30	7.14	8.45	8.26
HC, PPMC	1749	327	1303	588	2706	2386
NOX, PPM	87	109	55	63	3	3
AIR/FUEL RATIO	18.84	19.06	21.77	21.86	23.39	23.21
EMISSION RATES, G/HR						
CO	172.9	3.4	80.2	16.5	49.8	32.5
HC	39.0	7.4	24.7	11.4	46.5	41.3
NOX+	9.3	11.8	5.0	5.8	.2	.2
OIL TEMPERATURE, F	201	201	195	195	191	191
OIL PRESSURE, PSI	20	20	21	21	20	20
COOLANT TEMPERATURE, F	178	178	177	177	176	176
EXHAUST PRESSURE, IN. H2O	1.0	.0	1.0	.0	.0	.0
EXHAUST TEMPERATURE, F	515	533	432	476	402	392

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	13.01	13.02	14.01	14.02	15.01	15.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/26/78	6/26/78	6/26/78	6/26/78	6/26/78	6/26/78
BAROMETER, MMHG	738.8	738.8	738.9	738.9	738.9	738.9
HUMIDITY, GRAINS/LB	142	142	114	114	114	114
TEMPERATURE, F	73	73	75	75	78	78
ENGINE SPEED, RPM	1300	1300	1300	1300	1300	1300
TORQUE, FT-LB	171.2	171.2	154.0	154.0	128.4	128.4
POWER, BHP*	43.5	43.5	38.7	38.7	32.2	32.2
FUEL RATE, LB/HR	19.2	19.3	17.2	17.3	14.6	14.7
IGNITION TIMING, DEG BTDC	19.0	19.0	20.0	20.0	21.0	21.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-2.2	-2.2	-2.8	-2.8	-3.8	-3.8
AFTER TURBOCHARGER	-4	-4	-2.0	-2.0	-3.5	-3.5
THROTTLE ANGLE, DEG	26.5	26.5	23.0	23.0	18.5	18.5
INTAKE MAN. TEMP., F	76	76	97	97	131	131
CONCENTRATIONS, DRY BASIS						
CO, %	1.2506	.9641	.5951	.0122	.0662	.0010
CO2, %	13.73	14.20	13.83	14.61	13.90	14.03
O2, %	.66	.16	.88	.31	1.24	1.03
HC, PPM	1549	666	1529	123	1321	119
NOX, PPM	1116	1172	1165	1153	962	949
AIR/FUEL RATIO	14.57	14.47	15.02	15.04	15.54	15.55
EMISSION RATES, G/HR						
CO	1430.7	1102.1	633.2	13.0	62.1	.9
HC	89.0	38.2	81.7	6.6	62.2	5.6
NOX†	306.9	322.0	250.2	248.3	182.2	181.0
OIL TEMPERATURE, F	206	206	191	191	222	222
OIL PRESSURE, PSI	20	20	30	30	25	25
COOLANT TEMPERATURE, F	183	183	180	180	183	183
EXHAUST PRESSURE, IN. H2O	5.0	1.0	4.0	.0	3.0	.0
EXHAUST TEMPERATURE, F	856	833	779	829	828	774

* CORRECTED SAE J816B

† CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

INTAKE MAN. PRESSURE, IN HG

BEFORE TURBOCHARGER

AFTER TURBOCHARGER

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO₂, %

O₂, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H₂O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

16.01	16.02	17.01	17.02	18.01	18.02
I	2	I	2	I	2
6/26/78	6/26/78	6/26/78	6/26/78	6/27/78	6/27/78
738.9	738.9	738.9	738.9	746.5	746.5
114	114	114	114	80	80
78	78	80	80	72	72
1300	1300	1300	1300	1300	1300
102.7	102.7	68.5	68.5	42.8	42.8
25.8	25.8	17.2	17.2	10.5	10.5
12.8	12.8	9.5	9.6	7.8	7.8
28.0	28.0	36.0	36.0	38.0	38.0
-6.2	-6.2	-9.8	-9.8	-13.6	-13.6
-6.5	-6.5	-10.6	-10.6	-15.0	-15.0
13.5	13.5	8.0	8.0	6.0	6.0
184	184	163	163	125	125
4645	1219	4296	4015	4187	4019
14.05	14.72	11.80	12.36	10.97	11.51
.65	.11	4.14	3.71	5.33	4.89
1829	322	1620	188	1910	263
337	156	117	142	61	84
14.86	14.80	17.67	17.74	18.85	18.94
365.2	94.7	298.2	1.1	254.9	1.2
72.2	12.6	56.5	6.6	58.4	8.1
53.5	24.5	16.4	20.0	6.2	8.6
220	220	214	214	195	195
25	25	26	26	30	30
181	181	178	178	185	185
2.0	.0	1.0	1.0	.0	.0
763	758	678	712	568	576

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	19.01	19.02	20.01	20.02	21.01	21.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/27/78	6/27/78	6/27/78	6/27/78	6/23/78	6/23/78
SAROMETER, MMHG	746.5	746.5	746.5	746.5	742.5	742.5
HUMIDITY, GRAINS/LB	80	80	80	80	93	93
TEMPERATURE, F	73	73	75	75	72	72
ENGINE SPEED, RPM	1300	1300	1300	1300	1700	1700
TORQUE, FT-LB	17.0	17.0	1.4	1.4	180.0	180.0
POWER, BHP*	4.2	4.2	.3	.3	58.5	58.5
FUEL RATE, LB/HR	5.5	5.6	4.1	4.0	26.1	26.1
IGNITION TIMING, DEG BTDC	38.0	38.0	34.0	34.0	23.0	23.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-17.8	-17.8	-21.0	-21.0	-2.6	-2.6
AFTER TURBOCHARGER	-18.0	-18.0	-22.0	-22.0	.8	.8
THROTTLE ANGLE, DEG	3.0	3.0	1.2	1.2	31.0	31.0
INTAKE MAN. TEMP., F	137	137	78	78	114	114
CONCENTRATIONS, DRY BASIS						
CO, %	2518	0128	1559	0389	1.0518	1.0510
CO2, %	9.71	10.19	8.58	8.76	14.17	14.20
O2, %	7.05	6.71	8.74	8.53	.37	.24
HC, PPMC	1933	446	1480	862	1440	1256
NOX, PPM	18	37	3	9	1077	1087
AIR/FUEL RATIO	21.17	21.16	24.10	24.06	14.49	14.43
EMISSION RATES, G/HR						
CO	124.1	6.3	64.9	15.9	1614.1	1611.0
HC	47.8	11.1	30.9	17.8	111.0	96.7
NOX+	1.5	3.1	.2	.6	296.8	299.3
OIL TEMPERATURE, F	206	206	200	200	216	216
OIL PRESSURE, PSI	28	28	28	28	34	34
COOLANT TEMPERATURE, F	183	183	180	180	184	184
EXHAUST PRESSURE, IN. H2O	.0	.0	.0	.0	5.0	2.0
EXHAUST TEMPERATURE, F	527	543	440	450	964	878

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	22.01	22.02	23.01	23.02	24.01	24.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/27/78	6/27/78	6/27/78	6/27/78	6/27/78	6/27/78
BAROMETER, MMHG	746.5	746.5	746.5	746.5	746.5	746.5
HUMIDITY, GRAINS/LB	80	80	80	80	80	80
TEMPERATURE, F	69	69	71	71	72	72
ENGINE SPEED, RPM	1700	1700	1700	1700	1700	1700
TORQUE, FT-LB	162.0	162.0	135.0	135.0	108.0	108.0
POWER, BHP*	52.0	52.0	43.3	43.3	34.6	34.6
FUEL RATE, LB/HR	23.9	23.9	20.3	20.3	17.2	17.2
IGNITION TIMING, DEG BTDC	23.0	23.0	25.0	25.0	32.0	32.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-3.2	-3.2	-4.0	-4.0	-6.7	-6.7
AFTER TURBOCHARGER	0	0	-2.0	-2.0	-6.5	-6.5
THROTTLE ANGLE, DEG	28.0	28.0	24.0	24.0	17.0	17.0
INTAKE MAN. TEMP., F	124	124	181	181	196	196
CONCENTRATIONS, DRY BASIS						
CO, %	4443	4039	4649	4008	2033	4008
CO2, %	14.32	14.80	14.03	14.27	14.36	14.69
O2, %	.67	.33	1.17	1.02	.77	.46
HC, PPMC	1260	90	1041	88	1478	121
NOX, PPM	1079	1096	1110	1097	792	800
AIR/FUEL RATIO	14.97	15.06	15.52	15.54	15.11	15.13
EMISSION RATES, G/HR						
CO	643.6	5.6	83.6	1.0	214.9	.9
HC	91.7	6.6	67.3	5.7	78.5	6.4
NOX+	263.6	269.1	241.3	237.7	141.2	142.6
OIL TEMPERATURE, F	231	231	237	237	236	236
OIL PRESSURE, PSI	30	30	30	30	30	30
COOLANT TEMPERATURE, F	186	186	186	186	183	183
EXHAUST PRESSURE, IN. H2O	5.0	1.0	4.0	1.0	3.0	1.0
EXHAUST TEMPERATURE, F	952	924	930	857	881	825

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	25.01	25.02	26.01	26.02	27.01	27.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/27/78	6/27/78	6/27/78	6/27/78	6/27/78	6/27/78
BAROMETER, MMHG	746.5	746.5	746.5	746.5	746.5	746.5
HUMIDITY, GRAINS/LB	80	80	80	80	80	80
TEMPERATURE, F	73	73	73	73	75	75
ENGINE SPEED, RPM	1700	1700	1700	1700	1700	1700
TORQUE, FT-LB	72.0	72.0	45.0	45.0	18.0	18.0
POWER, BHP*	23.1	23.1	14.4	14.4	5.8	5.8
FUEL RATE, LB/HR	12.8	12.8	10.7	10.7	7.9	7.9
IGNITION TIMING, DEG BTDC	40.0	40.0	40.0	40.0	40.0	40.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-10.6	-10.6	-12.7	-12.7	-16.0	-16.0
AFTER TURBOCHARGER	-11.0	-11.0	-13.5	-13.5	-17.5	-17.5
THROTTLE ANGLE, DEG	11.0	11.0	9.0	9.0	6.0	6.0
INTAKE MAN. TEMP., F	199	199	182	182	171	171
CONCENTRATIONS, DRY BASIS						
CO, %	2960	0008	2882	0008	3170	0007
CO2, %	11.87	12.22	11.35	11.80	10.34	10.86
O2, %	4.12	3.76	5.07	4.75	6.47	6.01
HC, PPMC	1214	120	1460	149	2289	270
NOX, PPM	329	325	95	118	21	61
AIR/FUEL RATIO	17.81	17.83	18.70	18.74	20.14	20.19
EMISSION RATES, G/HR						
CO	278.5	7	236.9	.6	207.0	5
HC	57.4	5.7	60.3	6.1	75.1	8.8
NOX+	52.2	51.9	13.2	16.3	2.4	6.7
OIL TEMPERATURE, F						
OIL PRESSURE, PSI	230	230	203	203	215	215
COOLANT TEMPERATURE, F	30	30	35	35	35	35
EXHAUST PRESSURE, IN. H2O	180	180	184	184	182	182
EXHAUST TEMPERATURE, F	1.0	0	1.0	0	0	0
	775	758	686	624	659	662

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	28.01	28.02	29.01	29.02	30.01	30.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/27/78	6/27/78	6/23/78	6/23/78	6/27/78	6/27/78
BAROMETER, MMHG	746.5	746.5	742.5	742.5	746.5	746.5
HUMIDITY, GRAINS/LB	80	80	93	93	80	80
TEMPERATURE, F	76	76	76	76	71	71
ENGINE SPEED, RPM	1700	1700	2000	2000	2000	2000
TORQUE, FT-LB	1.4	1.4	159.0	159.0	143.0	143.0
POWER, BHP*	4	4	60.8	60.8	54.0	54.0
FUEL RATE, LB/HR	5.9	5.9	26.8	27.0	25.1	25.1
IGNITION TIMING, DEG BTDC	40.0	40.0	24.0	24.0	26.0	26.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-19.0	-19.0	-3.5	-3.5	-4.2	-4.2
AFTER TURBOCHARGER	-20.5	-20.5	.8	.8	-4	-4
THROTTLE ANGLE, DEG	3.5	3.5	30.5	30.5	27.0	27.0
INTAKE MAN. TEMP., F	172	172	75	75	193	193
CONCENTRATIONS, DRY BASIS						
CO, %	2239	0007	1184	0009	1124	0007
CO2, %	8.94	9.53	14.51	14.63	14.55	14.72
O2, %	8.26	7.72	.71	.66	.77	.63
HC, PPMC	3801	360	945	169	926	86
NOX, PPM	3	3	1079	1083	1197	1206
AIR/FUEL RATIO	22.56	22.68	15.17	15.27	15.22	15.26
EMISSION RATES, G/HR						
CO	125.3	.4	194.8	1.4	173.0	1.1
HC	106.9	10.1	78.0	14.2	71.5	6.7
NOX+	.3	.3	318.8	324.1	310.7	313.4
OIL TEMPERATURE, F	212	212	252	252	232	232
OIL PRESSURE, PSI	35	35	30	30	35	35
COOLANT TEMPERATURE, F	181	181	186	186	183	183
EXHAUST PRESSURE, IN. H2O	.0	.0	5.0	.0	9.0	3.0
EXHAUST TEMPERATURE, F	596	617	1061	993	990	920

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	31.01	31.02	32.01	32.02	33.01	33.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/27/78	6/27/78	6/27/78	6/27/78	6/27/78	6/27/78
BAROMETER, MMHG	746.5	746.5	746.5	746.5	746.5	746.5
HUMIDITY, GRAINS/LB	80	80	80	80	80	80
TEMPERATURE, F	72	72	72	72	73	73
ENGINE SPEED, RPM	2000	2000	2000	2000	2000	2000
TORQUE, FT-LB	119.0	119.0	95.4	95.4	63.6	63.6
POWER, BHP*	44.9	44.9	36.0	36.0	24.0	24.0
FUEL RATE, LB/HR	22.1	22.1	17.9	17.9	14.0	14.0
IGNITION TIMING, DEG BTDC	30.0	30.0	37.0	37.0	40.0	40.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-6.0	-6.0	-9.2	-9.2	-12.1	-12.1
AFTER TURBOCHARGER	-5.0	-5.0	-8.5	-8.5	-12.0	-12.0
THROTTLE ANGLE, DEG	21.5	21.5	16.5	16.5	12.0	12.0
INTAKE MAN. TEMP., F	217	217	222	222	222	222
CONCENTRATIONS, DRY BASIS						
CO, %	1103	1007	1802	1808	3697	3697
CO2, %	14.65	14.66	12.48	12.74	11.76	12.25
O2, %	.57	.43	3.52	3.32	4.42	4.05
HC, PPMC	1144	93	696	71	792	91
NOX, PPM	1156	1155	935	888	337	320
AIR/FUEL RATIO	15.07	15.13	17.39	17.39	18.08	18.06
EMISSION RATES, G/HR						
CO	148.2	9	228.5	1.0	382.6	.8
HC	77.2	6.4	44.3	4.5	41.1	4.7
NOX+	262.0	264.6	200.1	190.2	58.9	55.9
OIL TEMPERATURE, F	245	245	242	242	235	235
OIL PRESSURE, PSI	30	30	30	30	35	35
COOLANT TEMPERATURE, F	193	193	180	180	179	179
EXHAUST PRESSURE, IN. H2O	6.0	2.0	6.0	2.0	4.0	2.0
EXHAUST TEMPERATURE, F	974	904	900	831	816	796

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	34.01	34.02	35.01	35.02	36.01	36.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/27/78	6/27/78	6/27/78	6/27/78	6/27/78	6/27/78
BAROMETER, MMHG	746.5	746.5	746.5	746.5	746.5	746.5
HUMIDITY, GRAINS/LB	80	80	80	80	80	80
TEMPERATURE, F	76	76	78	78	78	78
ENGINE SPEED, RPM	2000	2000	2000	2000	2000	2000
TORQUE, FT-LB	39.8	39.8	15.9	15.9	1.2	1.2
POWER, BHP*	15.0	15.0	6.0	6.0	.5	.5
FUEL RATE, LB/HR	12.0	12.1	8.9	9.1	7.9	7.8
IGNITION TIMING, DEG BTDC	40.0	40.0	40.0	40.0	40.0	40.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-14.2	-14.2	-16.0	-16.0	-18.0	-18.0
AFTER TURBOCHARGER	-15.0	-15.0	-17.3	-17.3	-19.0	-19.0
THROTTLE ANGLE, DEG	10.0	10.0	7.0	7.0	5.2	5.2
INTAKE MAN. TEMP., F	220	220	213	213	189	189
CONCENTRATIONS, DRY BASIS						
CO, %	3644	.0007	.4371	.0007	.2936	.0006
CO2, %	11.23	11.69	10.42	11.00	9.49	10.11
O2, %	5.12	4.82	6.12	5.69	7.49	6.91
HC, PPM	831	90	1346	154	3141	255
NOX, PPM	125	144	41	64	3	25
AIR/FUEL RATIO	18.81	18.85	19.83	19.86	21.44	21.46
EMISSION RATES, G/HR						
CO	339.5	7	319.0	5	207.2	4
HC	38.9	4.2	49.3	5.8	111.4	8.9
NOX+	19.7	22.7	5.1	8.0	.4	3.0
OIL TEMPERATURE, F	230	230	223	223	218	218
OIL PRESSURE, PSI	35	35	35	35	40	40
COOLANT TEMPERATURE, F	179	179	177	177	178	178
EXHAUST PRESSURE, IN. H2O	3.0	1.0	1.0	.0	1.0	1.0
EXHAUST TEMPERATURE, F	776	762	731	724	683	698

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	37.01	37.02	38.01	38.02	39.01	39.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE	6/23/78	6/23/78	6/27/78	6/27/78	6/27/78	6/27/78
TEST DATE	742.5	742.5	745.6	745.6	745.6	745.6
BAROMETER, MMHG	93	93	72	72	72	72
HUMIDITY, GRAINS/LB	77	77	70	70	73	73
TEMPERATURE, F	2400	2400	2400	2400	2400	2400
ENGINE SPEED, RPM	155.8	155.8	140.0	140.0	116.8	116.8
TORQUE, FT-LB	71.5	71.5	63.5	63.5	53.0	53.0
POWER, BHP*	32.9	32.9	30.4	30.4	26.2	26.2
FUEL RATE, LB/HR	27.0	27.0	30.0	30.0	35.0	35.0
IGNITION TIMING, DEG BTDC	-4.2	-4.2	-5.5	-5.5	-8.0	-8.0
INTAKE MAN. PRESSURE, IN HG	2.0	2.0	-5	-5	-4.5	-4.5
BEFORE TURBOCHARGER	32.5	32.5	28.5	28.5	23.0	23.0
AFTER TURBOCHARGER	60	60	235	235	248	248
THROTTLE ANGLE, DEG						
INTAKE MAN. TEMP., F						
CONCENTRATIONS, DRY BASIS						
CO, %	2584	4161	6822	7042	2970	3010
CO2, %	14.74	14.78	14.48	14.56	13.40	13.82
O2, %	39	13	23	13	2.06	1.79
HC, PPMC	853	234	1041	534	337	45
NOX, PPM	1109	1086	1132	1140	1161	1168
AIR/FUEL RATIO	14.91	14.73	14.60	14.58	16.15	16.12
EMISSION RATES, G/HR						
CO	508.5	813.0	1228.9	1264.1	511.5	1.6
HC	84.3	22.9	94.1	48.2	29.1	3.9
NOX+	392.2	381.2	331.1	332.2	324.5	324.4
OIL TEMPERATURE, F	265	265	250	250	264	264
OIL PRESSURE, PSI	32	32	35	35	35	35
COOLANT TEMPERATURE, F	187	187	186	186	183	183
EXHAUST PRESSURE, IN. H2O	6.0	6.0	11.0	4.0	10.0	3.0
EXHAUST TEMPERATURE, F	1149	1089	1081	1003	1048	993

* CORRECTED SAE J8168
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

INTAKE MAN. PRESSURE, IN HG

BEFORE TURBOCHARGER

AFTER TURBOCHARGER

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

40.01	40.02	41.01	41.02	42.01	42.02
1	2	1	2	1	2
6/27/78	6/27/78	6/27/78	6/27/78	6/27/78	6/27/78
745.6	745.6	745.6	745.6	745.6	745.6
72	72	72	72	72	72
75	75	75	75	76	76
2400	2400	2400	2400	2400	2400
93.5	93.5	62.0	62.0	38.9	38.9
42.4	42.4	28.1	28.1	17.6	17.6
22.3	22.1	17.1	17.1	13.9	13.9
39.0	39.0	40.0	40.0	40.0	40.0
-9.8	-9.8	-12.6	-12.6	-14.7	-14.7
-7.5	-7.5	-12.5	-12.5	-15.0	-15.0
19.0	19.0	14.5	14.5	11.5	11.5
231	231	241	241	236	236
.2733	.0008	.2989	.0008	.2545	.0008
12.70	12.95	11.93	12.24	11.17	11.58
2.95	2.90	4.17	3.99	5.08	4.86
393	62	468	64	495	66
1138	1123	519	497	190	191
16.90	17.05	17.95	18.02	18.95	18.92
422.3	1.3	375.8	1.0	278.5	.8
30.5	4.8	29.5	4.1	27.2	3.6
285.5	281.5	105.9	102.0	33.7	33.5
260	260	252	252	243	243
35	35	35	35	35	35
184	184	180	180	179	179
9.0	3.0	6.0	2.0	5.0	1.0
989	950	918	882	846	789

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

INTAKE MAN. PRESSURE, IN HG

BEFORE TURBOCHARGER

AFTER TURBOCHARGER

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

43.01	43.02	44.01	44.02	45.01	45.02
1	2	1	2	1	2
6/27/78	6/27/78	6/27/78	6/27/78	6/23/78	6/23/78
745.6	745.6	745.6	745.6	742.5	742.5
72	72	72	72	93	93
78	78	79	79	76	76
2400	2400	2400	2400	2800	2800
15.6	15.6	1.0	1.0	130.0	130.0
7.1	7.1	.5	.5	69.6	69.6
11.4	11.4	9.6	9.5	34.5	34.6
41.0	41.0	41.0	41.0	35.0	35.0
-16.4	-16.4	-17.6	-17.6	-6.5	-6.5
-17.0	-17.0	-19.0	-19.0	.8	.8
9.5	9.5	7.5	7.5	30.0	30.0
235	235	234	234	76	76
.1923	.0008	.2126	.0009	1.5935	1.6496
10.51	10.80	9.67	10.21	14.02	14.01
6.14	5.90	7.03	6.71	.21	.13
634	74	1696	202	1075	871
81	94	13	60	1138	1109
20.21	20.16	21.28	21.22	14.20	14.14
183.2	.7	182.9	.7	3155.6	3277.2
30.3	3.5	73.3	8.6	106.9	86.9
12.5	14.5	1.9	8.1	404.9	395.6
236	236	230	230	273	273
40	40	40	40	35	35
179	179	178	178	186	186
4.0	1.0	2.0	.0	6.0	1.0
811	754	784	733	1111	1031

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	46.01	46.02	47.01	47.02	48.01	48.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/27/78	6/27/78	6/27/78	6/27/78	6/27/78	6/27/78
BAROMETER, MMHG	745.6	745.6	745.6	745.6	745.6	745.6
HUMIDITY, GRAINS/LB	72	72	72	72	72	72
TEMPERATURE, F	73	73	75	75	75	75
ENGINE SPEED, RPM	2800	2800	2800	2800	2800	2800
TORQUE, FT-LB	117.0	117.0	97.5	97.5	78.0	78.0
POWER, BHP*	61.9	61.9	51.6	51.6	41.3	41.3
FUEL RATE, LB/HR	31.5	31.6	26.8	26.9	23.4	23.5
IGNITION TIMING, DEG BTDC	38.0	38.0	41.0	41.0	43.0	43.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-8.3	-8.3	-9.8	-9.8	-11.2	-11.2
AFTER TURBOCHARGER	-3.5	-3.5	-7.5	-7.5	-9.0	-9.0
THROTTLE ANGLE, DEG	26.0	26.0	22.0	22.0	20.0	20.0
INTAKE MAN. TEMP., F	270	270	264	264	252	252
CONCENTRATIONS, DRY BASIS						
CO, %	7566	7566	3836	3836	2587	2587
CO2, %	13.81	14.51	13.26	13.75	12.75	13.22
O2, %	1.09	.57	1.96	1.75	2.75	2.51
HC, PPMC	282	45	222	35	255	38
NOX, PPM	1125	1121	1132	1150	1131	1093
AIR/FUEL RATIO	15.21	15.23	16.05	16.10	16.76	16.71
EMISSION RATES, G/HR						
CO	1474.8	3.0	680.4	1.8	419.9	1.5
HC	27.6	4.4	19.8	3.1	20.8	3.1
NOX+	356.0	357.1	325.8	329.6	298.0	285.1
OIL TEMPERATURE, F	260	260	272	272	265	265
OIL PRESSURE, PSI	35	35	35	35	35	35
COOLANT TEMPERATURE, F	187	187	185	185	181	181
EXHAUST PRESSURE, IN. H2O	13.0	6.0	11.0	4.0	10.0	4.0
EXHAUST TEMPERATURE, F	1086	1099	1066	1016	1017	962

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

INTAKE MAN. PRESSURE, IN HG

BEFORE TURBOCHARGER

AFTER TURBOCHARGER

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

49.01	49.02	50.01	50.02	51.01	51.02
1	2	1	2	1	2
6/27/78	6/27/78	6/27/78	6/27/78	6/27/78	6/27/78
745.6	745.6	745.6	745.6	745.6	745.6
72	72	72	72	72	72
76	76	77	77	79	79
2800	2800	2800	2800	2800	2800
52.0	52.0	32.5	32.5	13.0	13.0
27.5	27.5	17.2	17.2	6.9	6.9
19.1	19.1	16.0	16.0	12.7	12.8
44.0	44.0	44.0	44.0	44.0	44.0
-13.4	-13.4	-15.1	-15.1	-16.7	-16.7
-12.5	-12.5	-15.5	-15.5	-17.5	-17.5
16.0	16.0	13.0	13.0	11.0	11.0
264	264	262	262	256	256
.2721	.0010	.2640	.0009	.2005	.0012
12.14	12.43	11.54	11.67	10.79	11.06
3.76	3.59	4.63	4.47	5.67	5.52
230	36	243	39	348	42
555	547	238	241	103	115
17.63	17.66	18.49	18.57	19.70	19.71
376.5	1.3	321.8	1.1	208.6	1.3
16.0	2.5	14.9	2.4	18.2	2.2
124.6	123.0	47.2	48.2	17.4	19.3
259	259	255	255	247	247
35	35	38	38	40	40
180	180	180	180	180	180
9.0	3.0	8.0	3.0	5.0	2.0
972	898	930	867	871	787

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

INTAKE MAN. PRESSURE, IN HG

BEFORE TURBOCHARGER

AFTER TURBOCHARGER

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

52.01	52.02	53.01	53.02	54.01	54.02
1	2	1	2	1	2
6/27/78	6/27/78	6/26/78	6/26/78	6/27/78	6/27/78
745.6	745.6	737.5	737.5	744.5	744.5
72	72	66	66	82	82
79	79	71	71	72	72
2800	2800	3400	3400	3400	3400
1.2	1.2	126.0	126.0	113.4	113.4
.6	.6	81.4	81.4	73.3	73.3
11.4	11.3	42.9	42.7	39.1	39.1
44.0	44.0	32.0	32.0	41.0	41.0
-17.7	-17.7	-7.2	-7.2	-8.2	-8.2
-18.5	-18.5	1.2	1.2	3.1	3.1
10.0	10.0	33.0	33.0	31.0	31.0
254	254	254	254	267	267
1716	0008	1.6492	1.8708	1.2960	1.4163
10.29	10.47	13.68	13.61	13.78	14.01
6.34	6.15	.14	.05	.51	.15
514	65	1087	808	781	202
72	81	1139	1014	1185	1188
20.55	20.57	14.12	13.99	14.54	14.31
167.7	8	4140.6	4642.5	3022.4	3237.3
25.2	3.2	137.0	100.7	91.4	23.2
11.5	12.8	451.1	396.8	470.2	462.2
244	244	247	247	263	263
40	40	40	40	35	35
180	180	186	186	182	182
4.0	1.0	20.0	6.0	17.0	17.0
850	775	1129	1056	1124	1090

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	55.01	55.02	56.01	56.02	57.01	57.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/27/78	6/27/78	7/14/78	7/14/78	6/28/78	6/28/78
BAROMETER, MMHG	744.5	744.5	744.0	744.0	747.1	747.1
HUMIDITY, GRAINS/LB	82	82	87	87	99	99
TEMPERATURE, F	73	73	76	76	70	70
ENGINE SPEED, RPM	3400	3400	3400	3400	3400	3400
TORQUE, FT-LB	94.5	94.5	75.6	75.6	50.4	50.4
POWER, BHP*	61.1	61.1	49.1	49.1	32.6	32.6
FUEL RATE, LB/HR	35.1	35.2	29.8	29.7	24.8	24.6
IGNITION TIMING, DEG BTDC	43.0	43.0	47.0	47.0	47.0	47.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-7.5	-7.5	-11.3	-11.3	-13.7	-13.7
AFTER TURBOCHARGER	-4.0	-4.0	-7.0	-7.0	-13.5	-13.5
THROTTLE ANGLE, DEG	28.5	28.5	25.0	23.0	20.5	20.5
INTAKE MAN. TEMP., F	283	283	296	296	251	251
CONCENTRATIONS, DRY BASIS						
CO, %	.9382	.1400	.4996	.0012	.4485	.0009
CO2, %	13.93	14.85	13.73	14.16	13.10	13.52
O2, %	.76	.10	1.30	1.10	2.43	2.23
HC, PPMC	357	38	149	24	75	18
NOX, PPM	1194	872	1041	1046	558	669
AIR/FUEL RATIO	14.90	14.84	15.50	15.61	16.36	16.45
EMISSION RATES, G/HR						
CO	1996.4	297.1	943.4	2.3	741.3	1.5
HC	38.2	4.0	14.1	2.3	6.2	1.5
NOX+	432.6	314.9	343.7	346.6	171.2	204.1
OIL TEMPERATURE, F	277	277	279	279	250	250
OIL PRESSURE, PSI	30	30	30	30	40	40
COOLANT TEMPERATURE, F	185	185	183	183	180	180
EXHAUST PRESSURE, IN. H2O	16.0	9.0	15.0	9.0	10.0	2.0
EXHAUST TEMPERATURE, F	1143	1169	1168	1135	1081	1011

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	58.01	58.02	59.01	59.02	60.01	60.02
TEST NUMBER	I	2	I	2	I	2
DATA SOURCE CODE						
TEST DATE	6/28/78	6/28/78	6/28/78	6/28/78	6/28/78	6/28/78
BAROMETER, MMHG	747.1	747.1	747.1	747.1	747.1	747.1
HUMIDITY, GRAINS/LB	99	99	99	99	99	99
TEMPERATURE, F	72	72	74	74	75	75
ENGINE SPEED, RPM	3400	3400	3400	3400	3400	3400
TORQUE, FT-LB	31.5	31.5	12.6	12.6	6	6
POWER, BHP*	20.4	20.4	8.1	8.1	4	4
FUEL RATE, LB/HR	20.7	20.7	17.1	17.3	15.0	15.1
IGNITION TIMING, DEG BTDC	47.0	47.0	47.0	47.0	47.0	47.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-14.8	-14.8	-16.6	-16.6	-17.5	-17.5
AFTER TURBOCHARGER	-14.0	-14.0	-17.0	-17.0	-18.0	-18.0
THROTTLE ANGLE, DEG	18.0	18.0	15.0	15.0	13.0	13.0
INTAKE MAN. TEMP., F	271	271	263	263	260	260
CONCENTRATIONS, DRY BASIS						
CO, %	1820	0007	3360	0006	2498	0006
CO2, %	12.09	12.24	11.85	12.55	11.35	11.71
O2, %	4.16	3.99	4.28	3.57	4.95	4.73
HC, PPMC	106	16	103	18	119	17
NOX, PPM	418	406	119	113	84	89
AIR/FUEL RATIO	18.04	18.02	18.06	17.60	18.84	18.77
EMISSION RATES, G/HR						
CO	277.4	1.1	425.1	.8	291.7	.7
HC	8.1	1.2	6.5	1.1	7.0	1.0
NOX+	118.5	115.0	28.1	26.2	18.2	19.3
OIL TEMPERATURE, F	268	268	264	264	270	270
OIL PRESSURE, PSI	35	35	36	36	37	37
COOLANT TEMPERATURE, F	185	185	182	182	181	181
EXHAUST PRESSURE, IN. H2O	9.0	2.0	9.0	1.0	5.0	1.0
EXHAUST TEMPERATURE, F	1027	939	1005	923	970	895

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	61.01	61.02	62.01	62.02	63.01	63.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/28/78	6/28/78	6/28/78	6/28/78	6/28/78	6/28/78
BAROMETER, MMHG	747.1	747.1	747.1	747.1	747.1	747.1
HUMIDITY, GRAINS/LB	99	99	99	99	99	99
TEMPERATURE, F	72	72	76	76	73	73
ENGINE SPEED, RPM	4000	4000	4000	4000	4000	4000
TORQUE, FT-LB	125.0	125.0	112.5	112.5	93.8	93.8
POWER, BHP*	95.0	95.0	85.5	85.5	71.3	71.3
FUEL RATE, LB/HR	77.2	77.2	69.7	69.3	43.7	43.6
IGNITION TIMING, DEG BTDC	38.0	38.0	41.0	41.0	38.0	38.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-6.0	-6.0	-6.6	-6.6	-8.6	-8.6
AFTER TURBOCHARGER	6.9	6.9	4.1	4.1	.0	.0
THROTTLE ANGLE, DEG	39.0	39.0	34.0	34.0	32.0	32.0
INTAKE MAN. TEMP., F	189	189	257	257	286	286
CONCENTRATIONS, DRY BASIS						
CO, %	11.6200	11.8600	11.5600	11.8800	1.7475	1.9016
CO2, %	7.63	7.69	7.84	7.84	13.58	13.59
O2, %	.04	.03	.03	.01	.28	.10
HC, PPM	2066	1848	2141	1910	981	708
NOX, PPM	74	75	92	72	1064	993
AIR/FUEL RATIO	10.08	10.06	10.15	10.09	14.17	14.02
EMISSION RATES, G/HR						
CO	41637.8	41892.7	37122.4	37332.0	4475.6	4807.9
HC	371.8	327.8	345.4	301.5	126.1	89.9
NOX+	48.9	49.2	54.7	42.0	506.3	466.6
OIL TEMPERATURE, F	242	242	283	283	275	275
OIL PRESSURE, PSI	37	37	30	30	32	32
COOLANT TEMPERATURE, F	195	195	183	183	193	193
EXHAUST PRESSURE, IN. H2O	40.0	30.0	37.0	26.0	24.0	16.0
EXHAUST TEMPERATURE, F	1023	1000	1073	1023	1156	1091

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE	64.01	64.02	65.01	65.02	66.01	66.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE	6/28/78	6/28/78	6/28/78	6/28/78	6/28/78	6/28/78
TEST DATE	747.1	747.1	747.1	747.1	747.1	747.1
BAROMETER, MMHG	99	99	99	99	99	99
HUMIDITY, GRAINS/LB	76	76	73	73	77	77
TEMPERATURE, F	4000	4000	4000	4000	4000	4000
ENGINE SPEED, RPM	75.0	75.0	50.0	50.0	31.2	31.2
TORQUE, FT-LB	57.0	57.0	38.0	38.0	23.8	23.8
POWER, BHP*	40.0	39.7	32.3	30.8	27.9	28.1
FUEL RATE, LB/HR	40.0	40.0	50.0	50.0	49.0	49.0
IGNITION TIMING, DEG BTDC						
INTAKE MAN. PRESSURE, IN HG	-10.0	-10.0	-13.4	-13.4	-14.4	-14.4
BEFORE TURBOCHARGER	-2.5	-2.5	-9.0	-9.0	-11.5	-11.5
AFTER TURBOCHARGER	23.0	23.0	23.0	23.0	20.5	20.5
THROTTLE ANGLE, DEG	310	310	251	251	277	277
INTAKE MAN. TEMP., F						
CONCENTRATIONS, DRY BASIS						
CO, %	1.6405	1.5743	.8343	.0013	1.5012	1.7851
CO2, %	13.70	13.80	13.66	14.45	13.69	13.88
O2, %	.27	.09	1.04	.71	.55	.04
HC, PPMC	451	248	78	22	174	139
NOX, PPM	1010	983	702	873	257	186
AIR/FUEL RATIO	14.26	14.20	15.15	15.32	14.50	14.07
EMISSION RATES, G/HR						
CO	3855.4	3662.0	1676.2	2.5	2486.8	2884.9
HC	53.2	29.0	7.9	2.1	14.4	11.3
NOX+	441.0	425.0	262.0	312.1	79.0	55.7
OIL TEMPERATURE, F	299	299	259	259	288	288
OIL PRESSURE, PSI	29	29	35	35	32	32
COOLANT TEMPERATURE, F	191	191	190	190	193	193
EXHAUST PRESSURE, IN. H2O	22.0	15.0	16.0	7.0	15.0	7.0
EXHAUST TEMPERATURE, F	1228	1163	1160	1130	1236	1205

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	67.01	67.02	68.01	68.02	69.01	69.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/28/78	6/28/78	6/28/78	6/28/78	6/28/78	6/28/78
BAROMETER, MMHG	747.1	747.1	747.1	747.1	747.1	747.1
HUMIDITY, GRAINS/LB	99	99	99	99	99	99
TEMPERATURE, F	79	79	79	79	86	86
ENGINE SPEED, RPM	4000	4000	4000	4000	800	800
TORQUE, FT-LB	12.5	12.5	3.6	3.6	2.6	2.6
POWER, BHP*	9.5	9.5	2.7	2.7	.4	.4
FUEL RATE, LB/HR	21.3	20.8	18.8	18.5	2.6	2.6
IGNITION TIMING, DEG BTDC	49.0	49.0	50.0	50.0	23.0	23.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-16.2	-16.2	-16.3	-16.3	-20.0	-20.0
AFTER TURBOCHARGER	-15.0	-15.0	-16.0	-16.0	-21.0	-21.0
THROTTLE ANGLE, DEG	17.5	17.5	17.0	17.0	.0	.0
INTAKE MAN. TEMP., F	278	278	276	276	119	119
CONCENTRATIONS, DRY BASIS						
CO, %	5003	.0011	1457	.0008	1550	.0005
CO2, %	13.08	13.56	12.19	12.29	8.72	9.04
O2, %	2.42	1.68	3.92	3.88	8.57	8.33
HC, PPMC	80	34	92	27	3217	285
NOX, PPM	144	160	175	180	3	2
AIR/FUEL RATIO	16.31	16.03	17.85	17.92	23.33	23.78
EMISSION RATES, G/HR						
CO	708.7	1.5	200.8	1.1	39.3	.1
HC	5.7	2.3	6.4	1.8	41.0	3.7
NOX+	37.9	41.3	44.9	45.3	.1	.1
OIL TEMPERATURE, F	286	286	281	281	247	247
OIL PRESSURE, PSI	32	32	32	32	15	15
COOLANT TEMPERATURE, F	192	192	193	193	182	182
EXHAUST PRESSURE, IN. H2O	11.0	6.0	10.0	5.0	4.0	2.0
EXHAUST TEMPERATURE, F	1159	1094	1062	969	622	785

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	70.01	70.02	71.01	71.02	72.01	72.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE	6/28/78	6/28/78	6/28/78	6/28/78	6/28/78	6/28/78
TEST DATE	747.1	747.1	747.1	747.1	747.1	747.1
BAROMETER, MMHG	99	99	99	99	99	99
HUMIDITY, GRAINS/LB	86	86	84	84	83	83
TEMPERATURE, F	800	800	800	800	700	700
ENGINE SPEED, RPM	10.0	10.0	15.0	15.0	27.4	27.4
TORQUE, FT-LB	1.5	1.5	2.3	2.3	3.6	3.6
POWER, BHP*	3.5	3.5	3.4	3.4	3.4	3.4
FUEL RATE, LB/HR	25.0	25.0	25.0	25.0	24.0	24.0
IGNITION TIMING, DEG BTDC						
INTAKE MAN. PRESSURE, IN HG	-19.2	-19.2	-18.8	-18.8	-17.0	-17.0
BEFORE TURBOCHARGER	-20.0	-20.0	-20.0	-20.0	-18.0	-18.0
AFTER TURBOCHARGER	1.0	1.0	3.0	3.0	.0	.0
THROTTLE ANGLE, DEG	101	101	90	90	86	86
INTAKE MAN. TEMP., F						
CONCENTRATIONS, DRY BASIS						
CO, %	1081	0302	0995	0913	0643	0650
CO2, %	9.09	9.29	9.14	9.12	9.70	9.79
O2, %	8.22	7.85	8.03	8.04	7.26	7.26
HC, PPMC	2001	812	1736	1681	1995	1888
NOX, PPM	4	4	6	9	74	73
AIR/FUEL RATIO	23.00	22.86	22.84	22.89	21.63	21.59
EMISSION RATES, G/HR						
CO	36.2	10.1	32.7	30.1	19.7	19.7
HC	33.6	13.6	28.7	27.9	30.7	28.8
NOX+	2	2	3	.6	4.2	4.1
OIL TEMPERATURE, F	201	201	192	192	189	189
OIL PRESSURE, PSI	20	20	20	20	18	18
COOLANT TEMPERATURE, F	178	178	179	179	178	178
EXHAUST PRESSURE, IN. H2O	3.0	2.0	4.0	2.0	4.0	2.0
EXHAUST TEMPERATURE, F	385	438	367	397	339	318

* CORRECTED SAE J8168

+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	73.01	73.02	74.01	74.02	75.01	75.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/28/78	6/28/78	6/28/78	6/28/78	6/28/78	6/28/78
BAROMETER, MMHG	747.1	747.1	747.1	747.1	747.1	747.1
HUMIDITY, GRAINS/LB	99	99	99	99	99	99
TEMPERATURE, F	75	75	79	79	81	81
ENGINE SPEED, RPM	1000	1000	1000	1000	1000	1000
TORQUE, FT-LB	127.5	127.5	102.0	102.0	42.5	42.5
POWER, BHP*	24.2	24.2	19.4	19.4	8.1	8.1
FUEL RATE, LB/HR	12.7	12.5	9.9	10.0	5.3	5.3
IGNITION TIMING, DEG BTDC	18.0	18.0	17.0	17.0	32.0	32.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-3.0	-3.0	-3.8	-3.8	-15.2	-15.2
AFTER TURBOCHARGER	-2.5	-2.5	-4.0	-4.0	-16.0	-16.0
THROTTLE ANGLE, DEG	17.0	17.0	12.0	12.0	3.0	3.0
INTAKE MAN. TEMP., F	109	109	146	146	121	121
CONCENTRATIONS, DRY BASIS						
CO, %	.0904	.0017	.0620	.0013	.1215	.0018
CO2, %	13.63	13.97	13.64	13.85	10.59	10.76
O2, %	1.66	1.44	1.77	1.56	6.01	5.89
HC, PPMC	1595	188	1677	184	1899	303
NOX, PPM	844	821	262	263	122	138
AIR/FUEL RATIO	15.80	15.83	15.87	15.90	19.90	20.13
EMISSION RATES, G/HR						
CO	74.7	1.4	39.8	.8	53.5	.8
HC	66.2	7.7	54.1	6.0	42.0	6.8
NOX+	129.7	123.6	31.2	31.7	10.0	11.4
OIL TEMPERATURE, F	207	207	210	210	206	206
OIL PRESSURE, PSI	22	22	20	20	20	20
COOLANT TEMPERATURE, F	183	183	182	182	179	179
EXHAUST PRESSURE, IN. H2O	5.0	4.0	5.0	4.0	4.0	3.0
EXHAUST TEMPERATURE, F	734	629	675	649	549	604

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	76.01	76.02	77.01	77.02	78.01	78.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78
BAROMETER, MMHG	746.5	746.5	746.5	746.5	746.5	746.5
HUMIDITY, GRAINS/LB	88	88	88	88	88	88
TEMPERATURE, F	74	74	75	75	71	71
ENGINE SPEED, RPM	1000	1000	1000	1000	1300	1300
TORQUE, FT-LB	17.0	17.0	1.0	1.0	128.4	128.4
POWER, BHP*	3.2	3.2	.2	.2	31.5	31.5
FUEL RATE, LB/HR	3.8	3.8	3.4	3.4	14.8	14.7
IGNITION TIMING, DEG BTDC	26.0	26.0	26.0	26.0	22.0	22.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-19.3	-19.3	-21.0	-21.0	-3.5	-3.5
AFTER TURBOCHARGER	-20.0	-20.0	-21.5	-21.5	7.1	7.1
THROTTLE ANGLE, DEG	1.0	1.0	.8	.8	21.5	21.5
INTAKE MAN. TEMP., F	81	81	76	76	119	119
CONCENTRATIONS, DRY BASIS						
CO, %	1245	0008	1343	0692	0687	0009
CO2, %	9.32	9.61	8.38	8.56	13.92	14.18
O2, %	7.76	7.56	9.04	9.00	1.49	1.18
HC, PPHC	1458	228	2527	1426	1457	139
NOX, PPM	66	67	2	2	895	887
AIR/FUEL RATIO	22.44	22.49	24.40	24.58	15.69	15.64
EMISSION RATES, G/HR						
CO	44.8	3	47.3	24.0	65.1	.9
HC	26.3	4.1	44.7	24.8	69.3	6.5
NOX+	4.2	4.2	.1	.1	149.1	146.0
OIL TEMPERATURE, F	195	195	191	191	208	208
OIL PRESSURE, PSI	20	20	25	25	25	25
COOLANT TEMPERATURE, F	180	180	181	181	182	182
EXHAUST PRESSURE, IN. H2O	4.0	1.0	2.0	.0	6.0	2.0
EXHAUST TEMPERATURE, F	501	525	391	390	774	716

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

INTAKE MAN. PRESSURE, IN HG

BEFORE TURBOCHARGER

AFTER TURBOCHARGER

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PPESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST TEMPERATURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

79.01	79.02	80.01	80.02	81.01	81.02
1	2	1	2	1	2
7/14/78	7/14/78	6/29/78	6/29/78	6/29/78	6/29/78
744.0	744.0	746.5	746.5	746.5	746.5
87	87	88	88	88	88
74	74	76	76	77	77
1300	1300	1300	1300	1300	1300
102.7	102.7	42.8	42.8	17.1	17.1
25.5	25.5	10.5	10.5	4.2	4.2
12.6	12.6	7.4	7.2	5.5	5.5
28.0	28.0	37.0	37.0	36.0	36.0
-5.6	-5.6	-14.0	-14.0	-17.8	-17.8
-6.0	-6.0	-5.5	-5.5	-19.0	-19.0
14.0	14.0	8.0	8.0	6.0	6.0
180	180	143	143	138	138
.2904	.0211	.4224	.0009	.2885	.0014
14.17	14.60	11.00	11.58	9.93	10.30
.69	.36	5.48	5.05	7.08	6.76
1554	152	1841	212	1741	306
378	302	61	84	20	49
15.00	15.04	18.97	19.06	21.06	21.19
226.2	16.3	243.6	5	138.3	7
60.8	5.9	53.3	6.0	41.9	7.4
51.5	40.9	6.2	8.4	1.6	4.1
221	221	211	211	204	204
25	25	25	25	25	25
186	186	179	179	178	178
2.0	.0	6.0	1.0	6.0	1.0
766	738	613	660	530	585

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	82.01	82.02	83.01	83.02	84.01	84.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78
BAROMETER, MMHG	746.5	746.5	746.5	746.5	746.5	746.5
HUMIDITY, GRAINS/LB	88	88	88	88	88	88
TEMPERATURE, F	78	78	71	71	73	73
ENGINE SPEED, RPM	1300	1300	1700	1700	1700	1700
TORQUE, FT-LB	8	8	135.0	135.0	108.0	108.0
POWER, BHP*	2	2	43.3	43.3	34.6	34.6
FUEL RATE, LB/HR	3.9	4.0	19.9	19.8	16.6	16.7
IGNITION TIMING, DEG BTDC	33.0	33.0	25.0	25.0	31.0	31.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-21.0	-21.0	-3.5	-3.5	-7.3	-7.3
AFTER TURBOCHARGER	-22.5	-22.5	-2.5	-2.5	-6.5	-6.5
THROTTLE ANGLE, DEG	4.0	4.0	26.0	26.0	19.0	19.0
INTAKE MAN. TEMP., F	87	87	150	150	195	195
CONCENTRATIONS, DRY BASIS						
CO, %	1435	0038	1150	0009	1570	0009
CO2, %	8.61	8.87	14.28	14.47	12.93	13.19
O2, %	9.08	8.77	1.32	1.14	3.18	2.90
HC, PPMC	1338	459	1185	107	1052	104
NOX, PPM	2	6	1094	1132	839	792
AIR/FUEL RATIO	24.50	24.38	15.57	15.61	17.01	16.99
EMISSION RATES, G/HR						
CO	56.9	1.5	142.2	1.1	178.9	1.0
HC	26.6	9.4	73.6	6.6	60.2	6.0
NOX†	2	4	237.7	245.1	168.0	159.1
OIL TEMPERATURE, F	199	199	202	202	229	229
OIL PRESSURE, PSI	25	25	36	36	30	30
COOLANT TEMPERATURE, F	177	177	181	181	183	183
EXHAUST TEMPERATURE, IN. H2O	6.0	1.0	9.0	2.0	9.0	2.0
EXHAUST TEMPERATURE, F	476	492	877	826	859	804

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE:	7718	85.01	85.02	86.01	86.02	87.01	87.02
TEST NUMBER		1	2	1	2	1	2
DATA SOURCE CODE							
TEST DATE		6/29/78	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78
BAROMETER, MMHG		746.5	746.5	746.5	746.5	746.5	746.5
HUMIDITY, GRAINS/LB		88	88	88	88	88	88
TEMPERATURE, F		77	77	78	78	79	79
ENGINE SPEED, RPM		1700	1700	1700	1700	1700	1700
TORQUE, FT-LB		45.0	45.0	18.0	18.0	1.2	1.2
POWER, BHP*		14.4	14.4	5.8	5.8	4	4
FUEL RATE, LB/HR		10.2	10.2	7.5	7.5	5.7	5.7
IGNITION TIMING, DEG BTDC		39.0	39.0	39.0	39.0	39.0	39.0
INTAKE MAN. PRESSURE, IN HG							
BEFORE TURBOCHARGER		-13.1	-13.1	-16.2	-16.2	-19.5	-19.5
AFTER TURBOCHARGER		-14.0	-14.0	2.0	2.0	0	0
THROTTLE ANGLE, DEG		11.0	11.0	8.0	8.0	6.0	6.0
INTAKE MAN. TEMP., F		195	195	177	177	175	175
CONCENTRATIONS, DRY BASIS							
CO, %		3731	3684	3684	3684	2471	2471
CO2, %		11.44	11.92	10.39	10.91	9.23	9.74
O2, %		5.12	4.81	6.59	6.09	8.35	7.82
HC, PPMC		1410	147	2136	235	2955	373
NOX, PPM		99	116	23	60	2	3
AIR/FUEL RATIO		18.64	18.76	20.19	20.25	22.59	22.60
EMISSION RATES, G/HR							
CO		288.4	7	227.3	5	129.3	4
HC		54.7	5.7	66.2	7.4	77.7	9.8
NOX+		13.4	15.7	2.5	6.6	2	2
OIL TEMPERATURE, F		226	226	215	215	209	209
OIL PRESSURE, PSI		30	30	32	32	32	32
COOLANT TEMPERATURE, F		180	180	178	178	178	178
EXHAUST PRESSURE, IN. H2O		5.0	1.0	5.0	1.0	5.0	1.0
EXHAUST TEMPERATURE, F		736	707	661	644	598	591

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	88.01	88.02	89.01	89.02	90.01	90.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78
SAROMETER, MMHG	746.5	746.5	746.5	746.5	746.5	746.5
HUMIDITY, GRAINS/LB	88	88	88	88	88	88
TEMPERATURE, F	73	73	74	74	78	78
ENGINE SPEED, RPM	2000	2000	2000	2000	2000	2000
TORQUE, FT-LB	119.0	119.0	95.4	95.4	39.8	39.8
POWER, BHP*	44.9	44.9	36.0	36.0	15.0	15.0
FUEL RATE, LB/HR	21.8	21.6	17.9	17.9	11.4	11.5
IGNITION TIMING, DEG BTDC	31.0	31.0	36.0	36.0	40.0	40.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-6.6	-6.6	-9.4	-9.4	-14.2	-14.2
AFTER TURBOCHARGER	4.5	4.5	4.1	4.1	1.6	1.6
THROTTLE ANGLE, DEG	24.0	24.0	18.5	18.5	11.5	11.5
INTAKE MAN. TEMP., F	205	205	223	223	220	220
CONCENTRATIONS, DRY BASIS						
CO, %	1591	1011	2527	1010	4170	1009
CO2, %	14.88	15.21	12.52	13.02	11.36	11.88
O2, %	.55	.28	3.55	3.29	5.24	4.91
HC, PPMC	1266	92	704	81	913	105
NOX, PPM	1053	1070	869	837	109	124
AIR/FUEL RATIO	15.01	15.02	17.35	17.31	18.81	18.86
EMISSION RATES, G/HR						
CO	206.2	1.5	318.1	1.2	362.4	.8
HC	82.4	5.9	44.5	5.1	39.9	4.6
NOX+	240.0	241.7	192.3	182.8	16.6	19.0
OIL TEMPERATURE, F	233	233	241	241	233	233
OIL PRESSURE, PSI	35	35	31	31	34	34
COOLANT TEMPERATURE, F	178	178	189	189	179	179
EXHAUST PRESSURE, IN. H2O	10.0	4.0	9.0	4.0	5.0	3.0
EXHAUST TEMPERATURE, F	944	868	909	840	791	776

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	91.01	91.02	92.01	92.02	93.01	93.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78
BAROMETER, MMHG	747.2	747.2	747.2	747.2	747.2	747.2
HUMIDITY, GRAINS/LB	90	90	90	90	90	90
TEMPERATURE, F	78	78	79	79	73	73
ENGINE SPEED, RPM	2000	2000	2000	2000	2400	2400
TORQUE, FT-LB	15.9	15.9	2.0	2.0	116.8	116.8
POWER, BHP*	6.0	6.0	.8	.8	53.1	53.1
FUEL RATE, LB/HR	9.3	9.4	7.4	7.7	25.6	25.7
IGNITION TIMING, DEG BTDC	39.0	39.0	39.0	39.0	35.0	35.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-16.2	-16.2	-18.0	-18.0	-8.0	-8.0
AFTER TURBOCHARGER	-17.5	-17.5	-19.5	-19.5	-5.0	-5.0
THROTTLE ANGLE, DEG	10.0	10.0	8.0	8.0	25.0	25.0
INTAKE MAN. TEMP., F	198	198	188	188	235	235
CONCENTRATIONS, DRY BASIS						
CO, %	.4056	.0008	.3047	.0008	.1725	.0010
CO2, %	10.30	10.95	9.51	10.13	13.23	13.76
O2, %	6.30	5.84	7.53	6.97	2.59	2.07
HC, PPM	1793	171	3623	342	459	45
NOX, PPM	20	59	3	12	1130	1120
AIR/FUEL RATIO	20.00	20.01	21.35	21.49	16.61	16.32
EMISSION RATES, G/HR						
CO	311.2	7	200.2	.5	297.1	1.7
HC	69.1	6.6	119.5	11.7	39.7	3.8
NOX+	2.7	8.0	.3	1.5	345.1	334.7
OIL TEMPERATURE, F	197	197	216	216	241	241
OIL PRESSURE, PSI	42	42	39	39	38	38
COOLANT TEMPERATURE, F	180	180	183	183	184	184
EXHAUST PRESSURE, IN. H2O	5.0	1.0	5.0	1.0	12.0	4.0
EXHAUST TEMPERATURE, F	697	663	686	693	969	909

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	94.01	94.02	95.01	95.02	96.01	96.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78
TEST DATE	747.2	747.2	747.2	747.2	747.2	747.2
BAROMETER, MMHG	90	90	90	90	90	90
HUMIDITY, GRAINS/LB	76	76	78	78	80	80
TEMPERATURE, F	2400	2400	2400	2400	2400	2400
ENGINE SPEED, RPM	93.5	93.5	38.9	38.9	15.6	15.6
TORQUE, FT-LB	42.5	42.5	17.7	17.7	7.1	7.1
POWER, BHP*	22.2	22.2	13.8	14.0	11.0	10.9
FUEL RATE, LB/HR	38.0	38.0	40.0	40.0	40.0	40.0
IGNITION TIMING, DEG BTDC						
INTAKE MAN. PRESSURE, IN HG	-10.0	-10.0	-14.7	-14.7	-16.6	-16.6
BEFORE TURBOCHARGER	-7.5	-7.5	-15.0	-15.0	-17.5	-17.5
AFTER TURBOCHARGER	21.5	21.5	14.5	14.5	12.0	12.0
THROTTLE ANGLE, DEG	231	231	242	242	238	238
INTAKE MAN. TEMP., F						
CONCENTRATIONS, DRY BASIS						
CO, %	3423	3423	3439	3439	2132	2132
CO2, %	12.87	12.87	11.44	11.93	10.66	10.87
O2, %	2.99	2.75	4.94	4.69	6.18	5.97
HC, PPMC	373	45	404	59	711	69
NOX, PPM	1056	1050	195	199	79	89
AIR/FUEL RATIO	16.85	16.88	18.67	18.67	20.13	20.19
EMISSION RATES, G/HR						
CO	518.5	1.4	362.7	9	193.3	9
HC	28.4	3.4	21.4	3.1	32.4	3.1
NOX+	283.7	281.4	36.4	37.4	12.6	14.3
OIL TEMPERATURE, F	254	254	247	247	236	236
OIL PRESSURE, PSI	34	34	36	36	39	39
COOLANT TEMPERATURE, F	182	182	181	181	179	179
EXHAUST PRESSURE, IN. H2O	11.0	4.0	7.0	3.0	5.0	3.0
EXHAUST TEMPERATURE, F	985	934	886	846	822	777

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	97.01	97.02	98.01	98.02	99.01	99.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78
BAROMETER, MMHG	747.2	747.2	747.2	747.2	747.2	747.2
HUMIDITY, GRAINS/LB	90	90	83	83	83	83
TEMPERATURE, F	81	81	78	78	76	76
ENGINE SPEED, RPM	2400	2400	2800	2800	2800	2800
TORQUE, FT-LB	1.6	1.6	97.5	97.5	78.0	78.0
POWER, BHP*	.7	.7	51.7	51.7	41.4	41.4
FUEL RATE, LB/HR	9.3	9.4	27.1	27.1	23.2	23.2
IGNITION TIMING, DEG BTDC	40.0	40.0	40.0	40.0	42.0	42.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-17.6	-17.6	-10.0	-10.0	-11.5	-11.5
AFTER TURBOCHARGER	-19.0	-19.0	-6.5	-6.5	-9.0	-9.0
THROTTLE ANGLE, DEG	10.0	10.0	25.0	25.0	22.0	22.0
INTAKE MAN. TEMP., F	236	236	258	258	254	254
CONCENTRATIONS, DRY BASIS						
CO, %	2377	.0012	.1762	.0009	.2899	.0009
CO2, %	9.86	10.29	13.03	13.40	12.78	13.10
O2, %	7.07	6.70	2.63	2.43	3.06	2.89
HC, PPMC	2071	231	276	28	249	28
NOX, PPM	6	58	1148	1150	1021	1015
AIR/FUEL RATIO	21.10	21.16	16.69	16.63	16.97	17.01
EMISSION RATES, G/HR						
CO	194.4	1.0	326.1	1.7	463.9	1.4
HC	85.1	9.5	25.7	2.6	20.0	2.3
NOX+	.9	8.4	364.0	359.0	279.8	277.9
OIL TEMPERATURE, F	230	230	244	244	259	259
OIL PRESSURE, PSI	42	42	35	35	35	35
COOLANT TEMPERATURE, F	180	180	182	182	178	178
EXHAUST PRESSURE, IN. H2O	6.0	3.0	12.0	5.0	11.0	4.0
EXHAUST TEMPERATURE, F	774	739	1040	962	1024	954

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	100.01	100.02	101.01	101.02	102.01	102.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78
TEST DATE	747.2	747.2	747.2	747.2	747.2	747.2
BAROMETER, MMHG	83	83	83	83	83	83
HUMIDITY, GRAINS/LB	78	78	80	80	81	81
TEMPERATURE, F	2800	2800	2800	2800	2800	2800
ENGINE SPEED, RPM	32.5	32.5	13.0	13.0	1.2	1.2
TORQUE, FT-LB	17.2	17.2	6.9	6.9	.6	.6
POWER, BHP*	15.5	15.5	13.0	13.0	11.7	11.7
FUEL RATE, LB/HR	42.0	42.0	43.0	43.0	43.0	43.0
IGNITION TIMING, DEG BTDC	-15.3	-15.3	-16.8	-16.8	-17.8	-17.8
INTAKE MAN. PRESSURE, IN HG	-15.5	-15.5	-17.5	-17.5	-18.5	-18.5
BEFORE TURBOCHARGER	15.5	15.5	13.0	13.0	12.0	12.0
AFTER TURBOCHARGER	262	262	257	257	256	256
THROTTLE ANGLE, DEG	3021	0008	3027	0007	2224	0006
INTAKE MAN. TEMP., F	11.55	11.83	10.91	11.34	10.57	10.75
CONCENTRATIONS, DRY BASIS	4.82	4.65	5.60	5.30	6.14	5.97
CO, %	216	32	327	34	403	42
CO2, %	215	228	98	107	68	78
O2, %	18.61	18.68	19.48	19.40	20.19	20.26
HC, PPMC	356.2	9	315.0	.7	216.9	.6
NOX, PPM	12.8	1.9	17.1	1.8	19.7	2.1
AIR/FUEL RATIO	43.5	46.1	17.5	18.9	11.3	13.2
EMISSION RATES, G/HR	256	256	244	244	242	242
CO	36	36	40	40	40	40
HC	183	183	183	183	183	183
NOX+	6.0	3.0	5.0	2.0	4.0	4.0
OIL TEMPERATURE, F	946	850	878	814	865	783
OIL PRESSURE, PSI						
COOLANT TEMPERATURE, F						
EXHAUST PRESSURE, IN. H2O						
EXHAUST TEMPERATURE, F						

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718

TEST NUMBER	103.01	103.02	104.01	104.02	105.01	105.02
DATA SOURCE CODE	1	2	1	2	1	2
TEST DATE	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78	6/29/78
BAROMETER, MMHG	747.2	747.2	747.2	747.2	747.2	747.2
HUMIDITY, GRAINS/LB	83	83	83	83	83	83
TEMPERATURE, F	75	75	77	77	79	79
ENGINE SPEED, RPM	3400	3400	3400	3400	3400	3400
TORQUE, FT-LB	94.5	94.5	75.6	75.6	31.5	31.5
POWER, BHP*	60.8	60.8	48.7	48.7	20.3	20.3
FUEL RATE, LB/HR	34.4	34.5	30.9	30.9	19.4	19.3
IGNITION TIMING, DEG BTDC	43.0	43.0	47.0	47.0	48.0	48.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-9.6	-9.6	-11.4	-11.4	-15.0	-15.0
AFTER TURBOCHARGER	-4.0	-4.0	-7.0	-7.0	-14.5	-14.5
THROTTLE ANGLE, DEG	29.5	29.5	26.0	26.0	20.0	20.0
INTAKE MAN. TEMP., F	283	283	293	293	285	285
CONCENTRATIONS, DRY BASIS						
CO, %	9083	.0223	.8958	.0043	.2780	.0007
CO2, %	13.88	14.86	13.84	14.80	12.00	12.21
O2, %	.83	.26	.87	.31	3.93	3.89
HC, PPMC	371	27	171	24	98	18
NOX, PPM	1158	1098	1014	920	328	317
AIR/FUEL RATIO	14.96	15.01	15.01	15.05	17.81	17.95
EMISSION RATES, G/HR						
CO	1904.2	46.6	1692.5	8.0	396.3	1.0
HC	39.1	2.9	16.2	2.3	7.0	1.3
NOX+	415.9	393.6	328.0	296.7	80.2	77.5
OIL TEMPERATURE, F	265	265	280	280	272	272
OIL PRESSURE, PSI	32	32	30	30	30	30
COOLANT TEMPERATURE, F	184	184	185	185	183	183
EXHAUST PRESSURE, IN. H2O	12.0	6.0	11.0	5.0	6.0	3.0
EXHAUST TEMPERATURE, F	1125	1165	1184	1185	1073	939

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718	106.01	106.02	107.01	107.02	108.01	108.02
TEST NUMBER	1	2	1	2	1	2
DATA SOURCE CODE						
TEST DATE	6/29/78	6/29/78	6/29/78	6/29/78	6/30/78	6/30/78
BAROMETER, MMHG	747.2	747.2	747.2	747.2	744.5	744.5
HUMIDITY, GRAINS/LB	83	83	83	83	85	85
TEMPERATURE, F	80	80	80	80	69	69
ENGINE SPEED, RPM	3400	3400	3400	3400	4000	4000
TORQUE, FT-LB	12.6	12.6	.6	.6	93.8	93.8
POWER, BHP*	8.1	8.1	.4	.4	71.1	71.1
FUEL RATE, LB/HR	16.2	16.2	14.6	14.6	43.9	43.8
IGNITION TIMING, DEG BTDC	48.0	48.0	48.0	48.0	38.0	38.0
INTAKE MAN. PRESSURE, IN HG						
BEFORE TURBOCHARGER	-16.4	-16.4	-17.1	-17.1	-8.6	-8.6
AFTER TURBOCHARGER	-17.0	-17.0	-18.0	-18.0	.0	.0
THROTTLE ANGLE, DEG	17.0	17.0	16.0	16.0	32.0	32.0
INTAKE MAN. TEMP., F	268	268	261	261	284	284
CONCENTRATIONS, DRY BASIS						
CO, %	.2333	.0006	.1654	.0006	2.0221	1.9569
CO2, %	11.51	11.62	11.02	11.13	13.49	13.63
O2, %	4.79	4.68	5.33	5.35	.29	.11
HC, PPM	136	18	143	17	1041	693
NOX, PPM	141	149	106	113	1005	931
AIR/FUEL RATIO	18.67	18.77	19.37	19.52	14.05	14.01
EMISSION RATES, G/HR						
CO	290.5	.8	195.1	.7	5129.8	4943.1
HC	8.5	1.2	8.5	1.0	132.6	88.0
NOX+	30.0	32.1	21.4	22.9	441.1	406.9
OIL TEMPERATURE, F	262	262	259	259	273	273
OIL PRESSURE, PSI	35	35	37	37	30	30
COOLANT TEMPERATURE, F	185	185	184	184	193	193
EXHAUST PRESSURE, IN. H2O	5.0	3.0	4.0	1.0	15.0	9.0
EXHAUST TEMPERATURE, F	981	897	955	855	1178	1134

* CORRECTED SAE J816B
+ CORRECTED FOR HUMIDITY

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

INTAKE MAN. PRESSURE, IN HG

BEFORE TURBOCHARGER

AFTER TURBOCHARGER

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPM

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

109.01	109.02	110.01	110.02	111.01	111.02
1	2	1	2	1	2
6/30/78	6/30/78	6/30/78	6/30/78	6/30/78	6/30/78
744.5	744.5	744.5	744.5	744.5	744.5
85	85	85	85	85	85
75	75	76	76	76	76
4000	4000	4000	4000	4000	4000
75.0	75.0	31.3	31.3	12.9	12.5
56.8	56.8	23.7	23.7	9.8	9.5
38.3	38.2	30.1	30.1	23.6	23.7
40.0	40.0	49.0	49.0	49.0	49.0
-10.2	-10.2	-14.6	-14.6	-15.9	-15.9
-4.0	-4.0	-11.5	-11.5	-14.5	-14.5
29.0	29.0	20.5	20.5	18.0	18.0
305	305	274	274	274	274
1.1812	1.1694	2.8191	4.0443	1.4117	1.2102
14.13	14.28	13.29	12.50	13.45	14.42
.37	.12	.17	.05	1.22	.06
367	147	366	528	184	35
988	965	165	84	128	80
14.53	14.40	13.70	13.11	14.97	14.33
2663.9	2609.9	4743.0	6634.4	2020.7	1656.7
41.6	16.5	30.9	43.5	13.2	2.4
385.7	372.7	48.0	23.8	31.8	18.9
295	295	289	289	281	281
30	30	30	30	32	32
189	189	181	181	183	183
11.0	7.0	5.0	4.0	3.0	2.0
1239	1182	1272	1149	1252	1239

ENGINE: 1978 BUI 231-CID V-6 (TURBOCHARGED)

FUEL CODE: 7718

TEST NUMBER

DATA SOURCE CODE

TEST DATE

BAROMETER, MMHG

HUMIDITY, GRAINS/LB

TEMPERATURE, F

ENGINE SPEED, RPM

TORQUE, FT-LB

POWER, BHP*

FUEL RATE, LB/HR

IGNITION TIMING, DEG BTDC

INTAKE MAN. PRESSURE, IN HG

BEFORE TURBOCHARGER

AFTER TURBOCHARGER

THROTTLE ANGLE, DEG

INTAKE MAN. TEMP., F

CONCENTRATIONS, DRY BASIS

CO, %

CO2, %

O2, %

HC, PPMC

NOX, PPM

AIR/FUEL RATIO

EMISSION RATES, G/HR

CO

HC

NOX+

OIL TEMPERATURE, F

OIL PRESSURE, PSI

COOLANT TEMPERATURE, F

EXHAUST PRESSURE, IN. H2O

EXHAUST TEMPERATURE, F

* CORRECTED SAE J816B

+ CORRECTED FOR HUMIDITY

112.01	112.02
1	2
6/30/78	6/30/78
744.5	744.5
85	85
76	76
4000	4000
3.6	3.6
2.7	2.7
20.4	20.5
50.0	50.0
-17.0	-17.0
-16.5	-16.5
17.0	17.0
273	273
7484	7484
13.28	14.16
2.19	1.60
57	17
83	88
15.99	15.92
981.7	1.8
3.7	1.1
18.8	19.8
278	278
34	34
187	187
2.0	2.0
1200	1186

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NHTSA-79-8

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Aug 17, 2015

